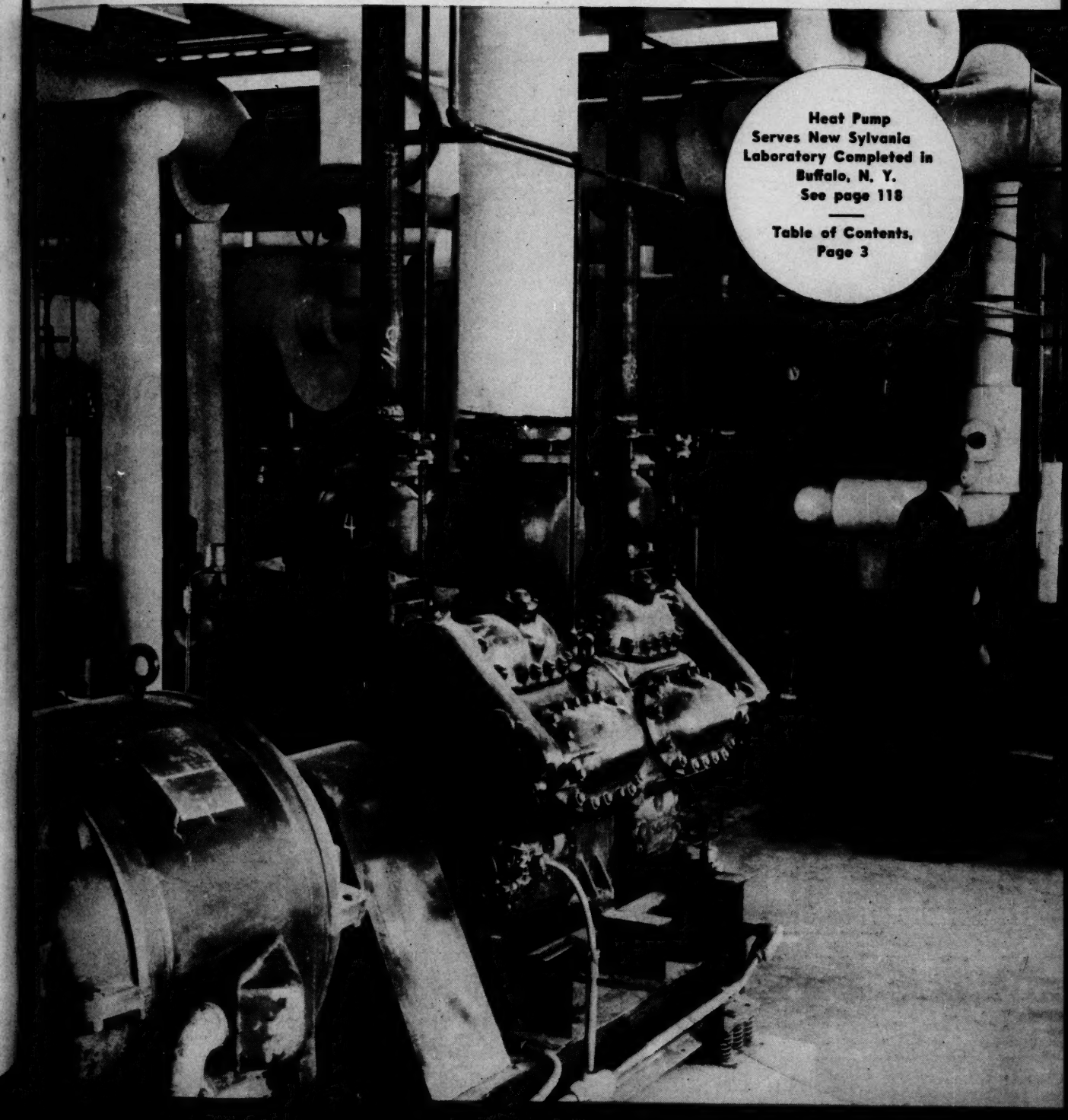
AIR CONDITIONING HEATING AND VENTILATING

JULY, 1958—55th Year



Heat Pump Serves New Sylvania Laboratory Completed in Buffalo, N. Y.
See page 118

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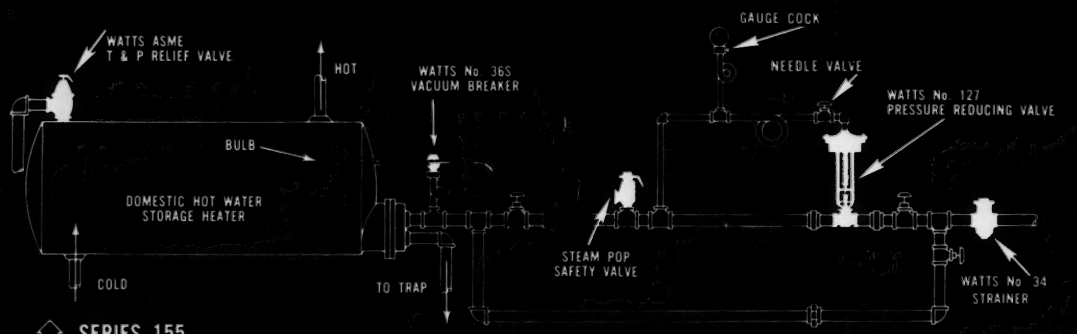
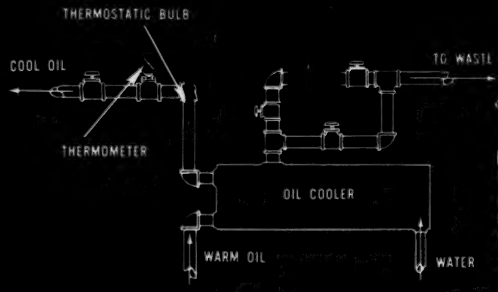
WATTS TEMPERATURE REGULATORS

Surest way to keep temperatures from getting out of control



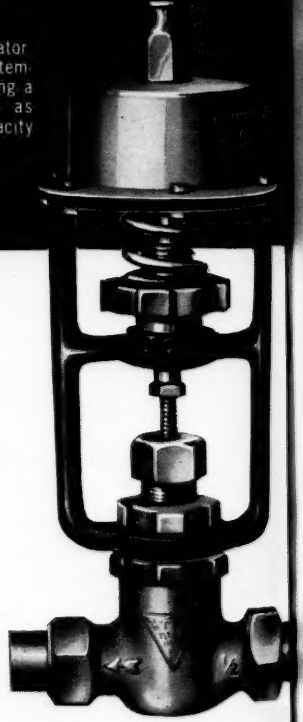
SERIES 155
Single Seated

Direct acting regulator. Maintains a constant temperature by controlling the heating source such as steam. Especially recommended for installations requiring tight seating, such as "Dead End" service.



NEW
SERIES 257
Double Seated

Reverse-acting regulator. Maintains a constant temperature by controlling a cooling fluid such as water. A large-capacity protective device.



In processing tanks, pipe lines, heat exchangers, air compressors — wherever constant temperatures *must* be maintained — you can count on Watts temperature regulating valves for *reliable* control of temperature.

Rugged, self-contained, and completely automatic, Watts Series 155 and Series 257 Temperature Regulators control the temperature of liquids with an accuracy never before achieved.

That's because *quality control* is as important to Watts engineers as temperature control, which means not only more efficient, trouble-free operation when Watts Regulators are installed, but longer valve service-life.

Watts Regulator Company, Lawrence, Mass.

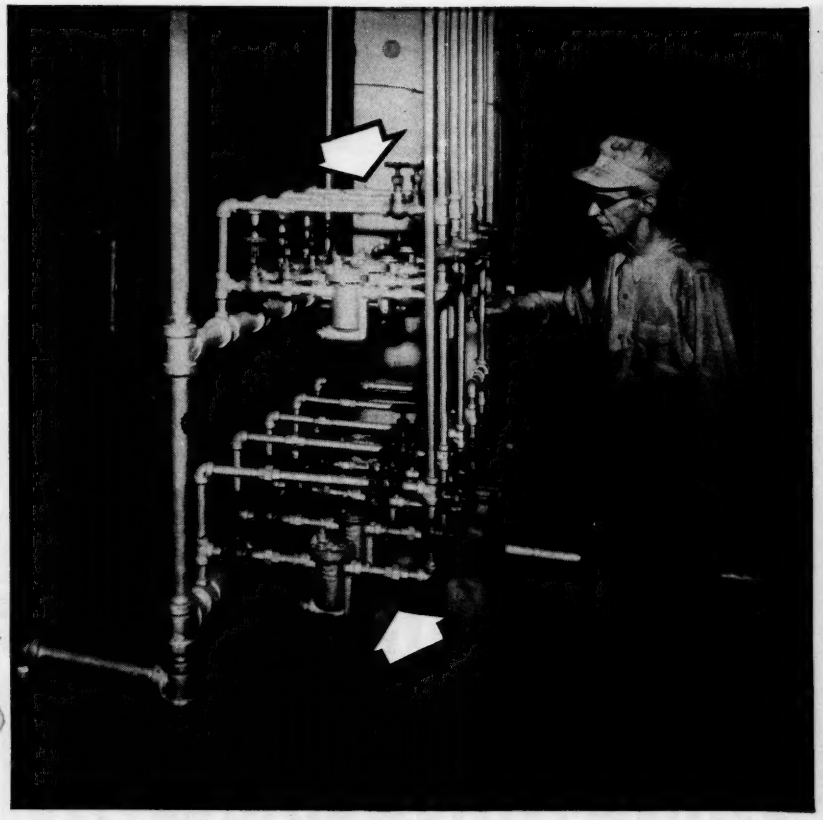
Be on the safe side with

WATTS

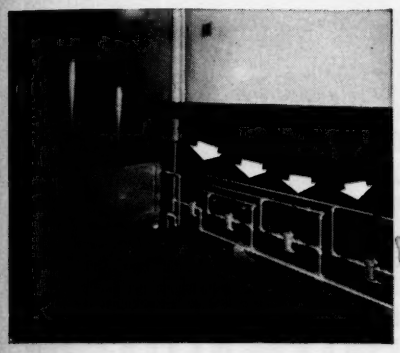
Protection and Control Specialties

LEARN MORE *about Watts Series 155 and 257 for automatic temperature control. Send for descriptive literature.*

Good Trapping Practice with Good Traps Roy Davis, Maintenance Superintendent, looks over one of the well-engineered Armstrong trap installations he has made at the Masonic Temple in Detroit. Traps discharge to 15" vacuum.



Keeping the Coffee Perkin' with Armstrong traps draining steam heated coffee urns.



Detroit's Masonic Temple Solves Vacuum Loss by Installing Armstrong Inverted Bucket Steam Traps

■ MANY AN engineering hour has been spent ferreting out the leaks in a vacuum return system. Here's a tip if you have the problem: *check your steam traps.* Don't worry about *flash* steam from traps—look for the traps that are leaking *live* steam. Take the case of the big Masonic Temple in Detroit:

The 11,600,000 cubic foot building has banquet space for 4500 persons at a sitting. Imagine the bedlam in the kitchen when the steam heated cooking equipment couldn't meet dinner schedules!—simply because condensate drainage was sluggish. The cooks were always in a stew and calls to the maintenance department were daily occurences.

The building buys 35 lb steam from Detroit Edison. Line pressure is used for the cooking kettles, while regulating stations supply 2 to 3 lb steam for the heating system.

Couldn't Hold Vacuum

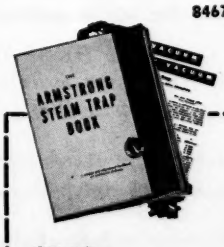
Prior to the installation of Armstrong traps, maximum vacuum attainable was 4 inches and in some cases it was necessary to manually drain the systems and dump the condensate.

According to Roy Davis, Maintenance Superintendent, the installation throughout of Armstrong inverted bucket steam traps has solved the problem. "*I don't remember having had the chefs complain since . . . the kettles heat in a hurry now.*"

F. W. Emblin, Operations Manager, adds, "*You can check the vacuum gage any time now and seldom find less than 15" showing.*"

There's another nice part to this story that only time will reveal: Armstrong traps have a habit of delivering this kind of service on low pressure vacuum return systems for years and years without repairs. Your local Armstrong Representative has plenty of cases he can tell you about. Why not call him today?

ARMSTRONG MACHINE WORKS
8467 Maple Street • Three Rivers, Michigan



FACT-FULL LITERATURE FOR YOU

FREE: 44-Page Steam Trap Book plus two reprints explaining facts about trap operation on vacuum return service.

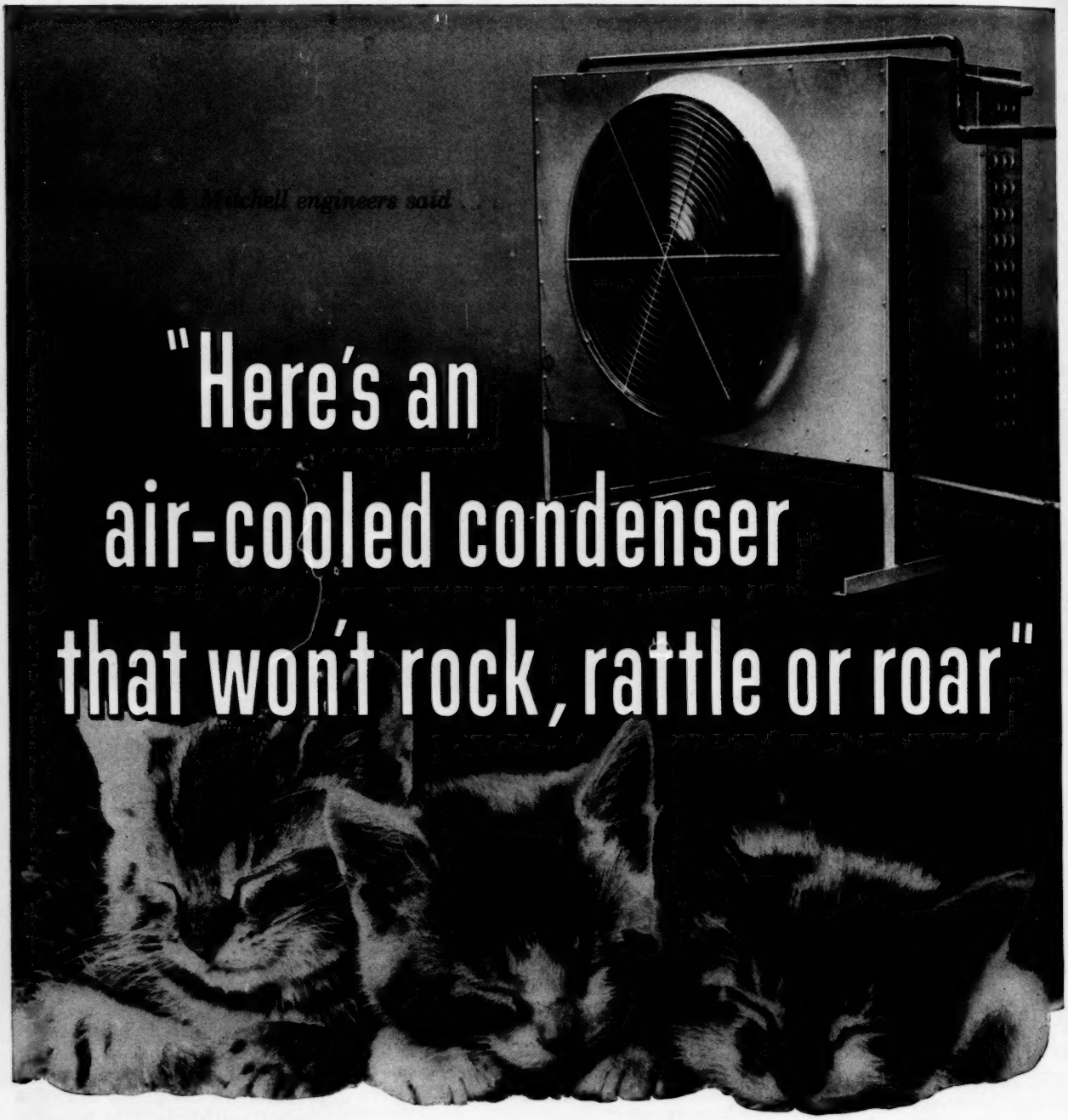
ARMSTRONG MACHINE WORKS
8467 Maple Street, Three Rivers, Michigan
Please send Steam Trap Book, "Flash at Traps" and "Vacuum Isn't Vacuum."

Name_____

Company_____

Street Address_____

City_____ Zone___ State_____



They planned it that way. H&M Air-Cooled Condensers had to be free of the vibrations, rattles and fan noise that plagued so many competitive models. And comments from contractors and users prove they hit their target.

The extra rugged casing won't loosen with use. Lock-tight construction avoids annoying rattles. Four-bladed, deep pitch fans are driven at slow speed for really quiet operation.

Halstead & Mitchell condensers are dependable, too. Large coil and exclusive Turbu-Flo design add more surface, improve heat transfer by up to 15%. Wide fin spacing prevents condenser clogging by dirt or other air-borne particles.

Designed for use with Refrigerants 12 or 22, H&M Air-Cooled Condensers are available in twelve models, from 3 to 50 tons capacity. Floor or ceiling mountings. Multiple circuiting for specified requirements, at no extra cost. Centrifugal Fan models are available for inside installations requiring ductwork.

Ask for H&M Air-Cooled Condensers at your distributors, or write for literature. Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22, Pa.

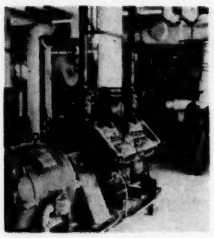
HM Halstead & Mitchell

Air-Cooled Condensers • Cooling Towers • Water-Cooled Condensers • Finned Coils

AIR CONDITIONING HEATING AND VENTILATING

Volume 55, Number 7 **July, 1958**

THE COVER



In left foreground is low stage compressor, one of two identical heat pump installations in new Sylvania laboratory. Photo courtesy of York Corp., a subsidiary of Borg-Warner Corporation.

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Perfection of water-conversion processes must be perfected by 1980 to provide for an expanding population and soaring fresh water consumption, said Sen. Clinton P. Anderson, D., N.M., co-sponsor of a resolution in the Irrigation and Reclamation subcommittee of the United States Senate calling for immediate construction of five full-scale plants to demonstrate the economic feasibility of converting salt water. Carrier Corp., Syracuse, N. Y., under contract with the government, is already working on a pilot plant.

United States Steel Corp., Pittsburgh, Pa., announces that it will begin next year to market aluminum-coated sheet steel. To be produced at its Irvin works, near Pittsburgh, the new product is said to combine the strength of carbon steel with aluminum's resistance to atmospheric corrosion and to heat.

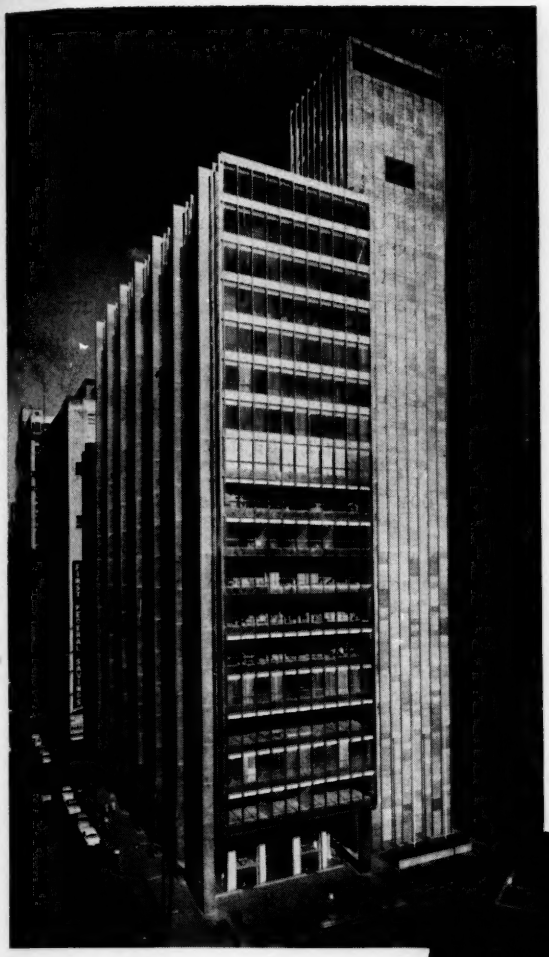
One of the greatest factors that discourages the construction of urban rental housing, Architectural Forum magazine declares, is the two-way spread between the tax deductability privileges available to home owners and the direct taxes on landlords' profits, which rental families pay as part of their rent. A random sampling conducted by the magazine showed, for example, that New Yorkers pay from $72 to $400 per year in federal taxes hidden in the rent of their 4-room apartments and that the federal tax bite in Chicago ranges from $170 to $265 per year for the same apartment.

Continuing a downward trend which began at mid-year 1957, manufacturers' shipments of compressor bodies in the first two months of 1958 were about 25% under shipments in January and February of 1957, Air-Conditioning and Refrigeration Institute, Washington, D.C., reports. The sharpest decreases were noted in the ¾- and 1-hp sizes. A 29.1% decrease in the 7½ to 25 hp sizes, and a 4.6% **increase** in the 30-hp and over category are seen from the statistics provided.

John E. Haines, vice-president of Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., told the seventh annual Building Research Institute in Washington, D.C., that **both initial and operating cost for year-round air conditioning systems** in commercial, public, and industrial buildings **could be cut considerably if activated charcoal filters were used and if less glass were utilized in modern construction.** As an example, he pointed out that if an air-conditioning system in Chicago requires 100,000 cfm and 20% minimum outdoor air, this 20,000 cfm can be reduced to 10,000 if the filters are used.

Well over 350,000 unit potential installations of heat pumps are waiting to be filled within the immediate future by the thirty or more manufacturing companies in the heat pump industry today, said Paul F. O'Neill, utility consultant for General Electric Air Conditioning Department, Bloomfield, N. J., in a speech before architects and consulting engineers at an electric heating symposium in Pittsburgh, Pa., sponsored by Duquesne Light Company. There are close to 50,000 installations of all kinds in the country today, Mr. O'Neil remarked, of which some 30,000 are in commercial and industrial establishments. A price decrease to as low as $450 a ton for certain commercial applications was noted. He predicted greater use of the split system heat pumps with considerable demand for roof-mounted units with air handling sections dispersed within the interior part of the building, and the teaming of lighting and other heat-producing loads to make heat-pump application more economical.

B&G EQUIPMENT INSTALLED FOR HEATING...SNOW MELTING ...AND DOMESTIC HOT WATER CIRCULATION IN INLAND STEEL BUILDING



Inland Steel Building, Chicago, Illinois

Architects and Engineers:
Skidmore, Owings & Merrill, Chicago.

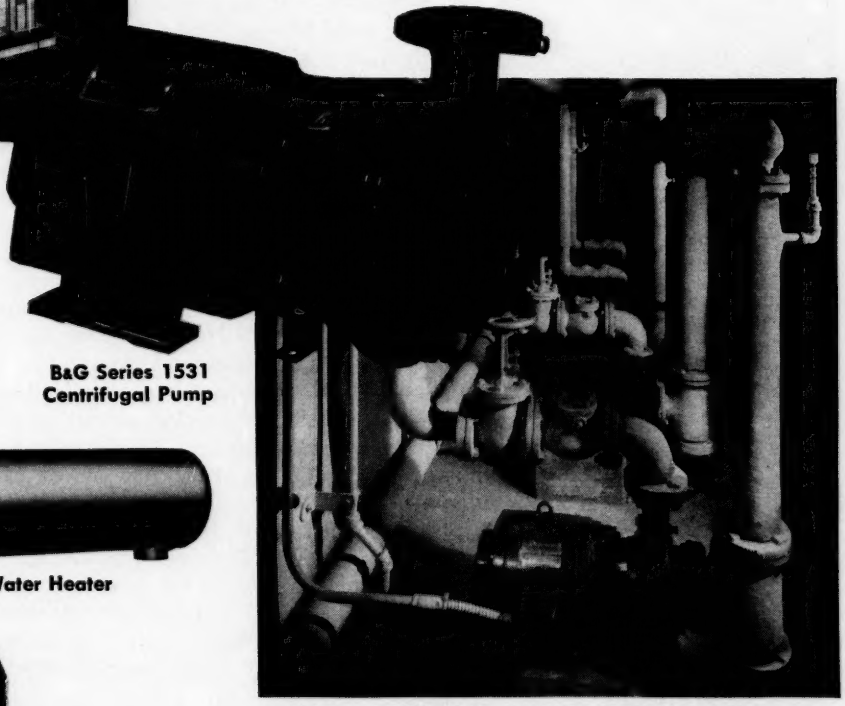
General Contractor:
Turner Construction Company, Chicago.

Mechanical Contractor: Economy Plumbing & Heating Company, Chicago.

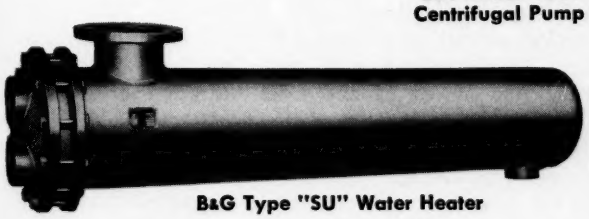
In this outstanding building, B&G Series 1531 Pumps are used in three different applications to (1) circulate water in the first floor heating system, (2) supply hot anti-freeze solution to snow melting panels, (3) circulate chilled water and cooling tower make-up water.

These pumps feature *vertical* split case construction which permits servicing without breaking pipe connections. They have leak-proof mechanical seals of "Remite"—a diamond-hard material developed by B&G.

The B&G Booster used to re-circulate domestic hot water is a bronze unit—immune to the corrosive effects of continuously circulated raw water. To heat the anti-freeze solution for the snow melting panels under the sidewalks and garage ramp and for supplying hot water to the first floor heating system, two B&G "SU" steam convertors are installed.



B&G Series 1531 Centrifugal Pump



B&G Type "SU" Water Heater

B&G Bronze Booster Pump

Battery of B&G Series 1531 Centrifugal Pumps in Inland Steel Building

Send for literature on these B&G Products

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Dept. PI-4, Morton Grove, Illinois

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WASHINGTON OVERTONES

by LORING F. OVERMAN

● Keynote of official Washington in mid-June was that the recession is now over; that future movements, although possibly a bit wobbly, will be generally upward.

This note of optimism has as its principal overtone the virtual certainty that Government will not have to resort to drastic measures to get the country back onto an even keel.

In other words — no deep tax cuts; no extensive pump-priming.

● As matters stood, tax-wise in mid-June:

House had passed and Senate Finance Committee had approved legislation extending corporate income tax rate of 52% through June, 1959. Continuation of existing excise tax rates on cigarettes, alcoholic beverages, automobiles, and a long list of other items was also recommended.

Senator Paul Douglas (D-Ill.) indicated he would offer drastic amendments when the bill reached Senate floor. His plan: Reduce personal income taxes by $3-billion; cut excises by $2.5-billion, and provide $500-million tax relief for small business.

The Douglas plan was given little chance of success, with Senate Republican Leader William F. Knowland promising to oppose any effort to write a tax cut into the bill.

● Pump-primers have not given up efforts to pass "emergency" measures, but many observers feel that the economy will have righted itself long before effects of spending bills could be felt.

There are three such measures nearing showdown votes:

Community Facilities Bill — would provide $2-billion in long-term Federal loans at low subsidized interest rates to municipalities to construct many kinds of local public works. Measure is awaiting its turn on House Calendar.

Urban Renewal Program — a part of omnibus housing bill. Senate Banking Committee has approved a compromise; recommended a six-year $2.1-billion authorization for slum clearance and renewal projects. Administration had asked for six-year program authorizing $1.3-billion. Committee also eliminated from the measure a proposal that a new co-insurance program operate through savings and loan associations through a new Federally sponsored corporation.

Area Re-development — House Banking Committee was scheduled to study in executive session the Senate-passed measure for a program of Federal grants and loans for industrial development in economically depressed areas. Opponents point out that such legislation, if enacted, would inaugurate a Federal program of subsidies for industrial development in selected areas, disregarding the fact that all communities are seeking to attract new industries, and strictly through local effort.

● Despite doubtful fate of the foregoing long-range spending programs, several current projects involving Federal purchases are helping the economy along.

Rate of Federal expenditures for goods and services is down $300-million below record peak annual rate of $51.1-billion, reached during second quarter of 1957. Indications are, however, that rate will exceed $52-billion by year-end. Bigger rise, for stepped up defense program, will come next year.

● Those in the air conditioning and heating-ventilating field should find much of encouragement in recent news from Washington.

Housing starts rose in May in a seasonally-adjusted annual rate of more than 1,000,000 units, compared with 950,000 in April. Also, applications for FHA and VA mortgages were literally swamping the Government's housing offices.

The good news in housing was somewhat offset by declines in industrial construction — estimated at 18% behind the first half of 1957. Optimists hold that this figure could take a quick turnabout if it became necessary to replace inventories

(Continued on page 8)

TECHNICAL *Bulletin* NO. 38

NATIONAL HOUSING AGENCY

Tests by the National Bureau of Standards

GET IT FREE!

CONCLUSIONS:
(Exact Quotations)

"1. **Condensation will not occur** in wooden floors over crawl spaces, where **reflective insulation** is installed in a normal fashion with some small percentage of openings which permit air to pass through."

"2. The **temperatures** of such insulation surfaces should remain above the dew point of the air in contact. The relative humidities of the air in the spaces within the floor structure are unaffected by opening or closing the crawl space."

"3. A perfect vapor seal by means of the reflective insulation, or other material, is neither necessary nor desirable and would probably permit condensation to occur in some cases. Perforations, of the order used, assure air flow upward through the floor structure, and provide drainage for water which might leak through the floor from above."

"4. Reflective insulation produces a **marked rise in the temperatures of the floor surface.**"

EXCERPTS
(Exact Quotations)

Severe Tests With Sudden Cooling

"**Eight tests** were made with a **single layer of reflective** insulation, six with steady ambient temperatures of **32° F.** and **10° F.**, and two in which the test box was preheated and then the ambient temperature reduced as rapidly as possible to determine whether a **sudden cooling** of the reflective insulation would cause moisture to condense on the upper side. **Three tests** were made with **two layers of reflective** insulation under the floor and with steady ambient temperatures at 25° F. or 32° F."

"**Condensation never occurred** on the upper surface of **either layer** of the reflective insulation **under all of the varied conditions** of these tests. The temperature of these surfaces was observed to be above the dew point of the contacting air under all test conditions."

Dew Point Never Reached

"At steady conditions with average outside air temperatures between 30.9 and 32.2 degrees F., the temperatures of the upper surface of the insulation remained above the dew point of the air to which it was exposed by 9.9 to 18.7 degrees F. with one layer of insulation and by 12.5 to 15.7 degrees F. with two layers of insulation."

"Under conditions where the temperature of the ambient air was reduced rapidly, and with one layer of insulation, the temperature of the upper surfaces of the insulation dropped with the dew point of the air to which it was exposed. When the outside temperature dropped from 56.3° F. to 31.4° F. in six hours, the insulation temperatures remained **above the dew point by 14.6 to 10.3° F.** When the ambient temperature was dropped from **39.2° F. to 9.2° F.** in 24 hours, the insulation temperatures remained above the dew point by 12.9 to 5.8° F."

"As a further indication of lack of condensation, the upper surface of the upper layer of insulation was **deliberately fogged** during several of the tests. Each time the surface of the insulation was so fogged, the condensed **moisture disappeared within 5 to 10 minutes.**"

"The results indicate that condensation would not occur between the floor and the insulation or between the two layers of insulation during any probable winter condition."

Send the coupon for a free copy of this remarkable and interesting Technical Bulletin No. 38.

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NAME _____

FIRM _____

ADDRESS _____

WASHINGTON OVERTONES *(Continued from page 6)*

of consumers goods to supply consumers not unwilling to spend for new homes and furnishings.

● Washington headquarters of the Air-Conditioning and Refrigeration Institute is also finding news that cheers.

Recent DuPont Company survey of non-residential areas for growth of air conditioning reveals that 70% of the nation's five-million commercial and industrial business establishments are not mechanically air conditioned.

DuPont indicated that 300,000 of these had indicated they plan to purchase air conditioning equipment within the next 12 months.

A follow-through on announced plans would see an increase in 1958 of 20% in the number of establishments equipped with mechanical cooling systems; 24,000 additions to present systems, and replacement of 29,000.

● Recalling restrictions placed upon air conditioning during recent "emergencies", the Air-Conditioning and Refrigeration Institute is following the precept that "a stitch in time" may save an industry.

ARI is distributing to Government, to city and college libraries, a new booklet, titled "Air Conditioning and Refrigeration — Essential to our Nation's Health, Productivity, Defense." The 26-page booklet was prepared at the recommendation of ARI's Government Relations Committee to explain how vital mechanical refrigeration and climate control have become to almost every phase of American life.

● The million new homes to be constructed this year, and in future years, represent the best market for residential air conditioning, a panel of experts told ARI's Air Conditioning Division at a recent session.

If the new home market is adequately covered, panel members felt, the owners of existing homes will become potential customers just to keep their homes in line with the new construction.

It was also pointed out that the new home market is relatively concentrated. In 1957, 50% of all new homes were built in six states; 75% in 15 states.

Panelists pointed out that all bottlenecks to residential sales have been removed. Included were FHA regulations involving higher income requirements for air conditioned homes, FHA requirements on the purchase of room air conditioners on home mortgages, the tight money situation of last year, and many others.

● Twenty-nine hundred new rural customers for electrically operated equipment, air conditioning included, will result from Rural Electrification Administration approval of eight electrification loans totaling $5,191,000 in the June 2-6 period.

● How to help small business continues to intrigue members of Congress.

Possibly because it likes to hold the rein on Government bureaus, the Senate Banking Committee has refused to concur with House action conferring permanent status on the Small Business Administration. Instead, the Committee approved an amended version of the House Bill (HR 7963) providing for a three year extension of the agency's activities, from July 31.

Other changes voted by the Senate Banking Committee: (1) loan ceiling for small borrowers raised to $350,000 from $250,000; (2) eliminated present Loan Policy Board and House-approved National Small Business Advisory Board; and (3) raised the 5% maximum interest rate specified by the House to 6%.

The House recommendation for a new definition of small business for purposes of federal procurement was also stricken by the Senate Committee.

● The House is soon to consider a Senate-approved measure (S 3651) authorizing equity financing for small business. The bill provides for a $250,000,000 revolving fund to help finance investment companies and local development companies which would do the actual long-term financing of small firms.

FREE! CADDY-WRENCH

from June 1 to August 1 with the purchase of any cylinder of genetron® 22

It's a wrench!
Fits "Genetron" cylinder valve stems and valve outlet caps—also fits stems of compressor service valves, soldering gas cylinders, etc.

Comfortable finger grips

1/4" tool steel, smooth plated finish

It's a carrying tool! Fits bonnet hole on small "Genetron" cylinders

Here's a tool you've never seen before—specially designed for the service engineer by General Chemical. It's a combination carrying tool and wrench. We call it a "Caddy-Wrench." And, like the "Jug-a-Lug" which we created for you two years ago, this is a tool that's really helpful, really useful.

Many uses! As a carrying tool, the "Caddy-Wrench" makes it easy to carry small size cylinders by the hood. *No more cuts, strains and finger injuries!* And as a wrench, it's designed to fit "Genetron" cylinder valve stems and valve outlet caps, also stems of compressor service valves, soldering gas cylinders, etc. *No more adjusting wrenches or using different tools, once you have this all-purpose cylinder wrench and carrying tool!* Made of quarter-inch solid tool steel, it's strong, sturdy, won't crack, bend or break. And the smooth plated finish makes it a pleasure to use. Be sure you get *your* "Caddy-Wrench"! *Here's the only way to get one:*

SEE YOUR WHOLESALER! When you buy any size cylinder of "Genetron" 22—*between June 1 and August 1 only*—your wholesaler will be glad to give you your "Caddy-Wrench" . . . *free!*

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BRIEFLY STATED

ENGINEERING SOCIETY NEWS

A plea to support National Water Conservation and National Pollution Control, as proposed in Bill #11714, by writing congressmen and senators appears in this month's News Letter of the American Society of Sanitary Engineering signed by Wilbur White, national president. Proposed by Congressmen John A. Blatnik, the bill aims to curb the misuse of national water resources, excessive lowering of water tables, and unwise land development. "Streams can be ruined by heedless dumping of sewage or industrial waste, or by funneling their water off through big sewers without replacements," Mr. White points out.

Chapters of the Society throughout the country have been very interested in the subject of water pollution. At the May meeting of the New Jersey chapter, the members were shown the moving picture "Clean Waters," which shows the vital importance of scientific treatment of sewerage and how the public is robbed of pleasure and health because rivers and streams are being polluted, and how wild life and farm lands are adversely affected by this pollution. The solution: more and improved sewerage treatment plants.

American methods for installation of residential oil heating and the codes and standards governing such installations were studied by heating engineers from Germany, here at the invitation of the American Society of Heating and Air-Conditioning Engineers.

E. R. Queer, president of the Society, welcomed the visitors at a luncheon in the Hotel Biltmore, New York City. Also in attendance were Society past presidents P. B. Gordon and L. N. Hunter, and Prof. Carl F. Kayan of the Society and the Department of Mechanical Engineering, Columbia University, and W. J. Olvany, president of the New York Chapter of the Society.

The twelve German engineers are all officials of the West German Government. During their stay in the United States the Society arranged for them to meet with officials of the Fire Department and Department of Buildings and other officials in New York, Chicago, Milwaukee, Minneapolis and Johnstown, Pa. They also were taken on inspection trips of typical residential constructions in Long Island, Levittown, Pa., and the Chicago suburbs.

While in Minneapolis the German engineers also attended the Semi-Annual Meeting of the Society in the Pick-Nicollet Hotel.

Arrangements for this opportunity to exchange technical information with their American colleagues were made by the Society's International Relations Committee comprised of L. N. Hunter, Johnstown, Pa.; P. B. Gordon, New York, N. Y.; J. E. Haines, past president of the Society, Minneapolis, Minn.; J. W. James, past president of the Society, Chicago, Ill.; Prof. Carl F. Kayan, New York, N. Y.; John S. Grossinger, Johnstown, Pa.; George B. Baan, New York, N. Y., and George H. Schoenbaum, New York, N. Y.

A study group of German heating, ventilating, and air conditioning engineers were guests of the Columbus Chapter of the Society. Ralph A. Sherman, Society treasurer in 1956 and Technical Director of Battelle Memorial Institute, Columbus, arranged for the visiting study groups to inspect Battelle, Armstrong Co., Ohio Fuel Gas Co., and the Columbus and Southern Ohio Electric Co.

Returning from Columbus, Ohio, the German engineers stopped in Washington, D. C. where they participated in an inspection trip planned for them by the Washington, D. C. Chapter of the Society. Their stay in Washington included the tour of the air-conditioning equipment in the Pentagon Building.

AMONG THE ENGINEERS

Captains Thomas H. Urdahl and Paul S. Bauer, USNR (Ret.), have joined forces under the name of URDAHL ASSOCIATES, 1300 Connecticut Avenue, N.W., Washington, D. C., a professional engineering firm. Capt. Urdahl has been a consultant in air conditioning since 1928, except for the years 1941-1946, during which time the office was closed and all personnel were engaged in active duty as officers of the armed forces. Capt. Urdahl was Officer-in-Charge of all air conditioning design policy, research, equipment development, and procurement for air conditioning, heating and ventilating all components of the United States Fleet. Capt. Bauer was a leader in the application of electronics to Naval aviation, and participated in Operation Deep Freeze 1 at the South Pole. Associated with the firm are Lawrence N. Gonzalez, projects director, and Robert B. Keating, executive engineer and special foreign representative . . .

Myron C. Beman, of the firm of BEMAN & CANDEE, consulting engineers, announces the relocation of the firm's offices at 154 West Huron St., Buffalo 1, N. Y. . . .

Maurice Martin and Spencer A. Tucker have organized the firm of MARTIN & TUCKER, with executive offices in the Chase Manhattan Bank Building, Little Neck 62, N. Y. The new firm has branch offices in Montreal and Toronto, and specializes in heating, piping, ventilating, air conditioning, and heat transfer research and engineering. Mr. Martin was formerly vice-president and chief engineer of Bassons Industries Corporation. Mr. Tucker was a principal in the now dissolved partnership that operated the Clement Moore Associates. Both have been performing engineering assignments in the above areas for 21 years . . .

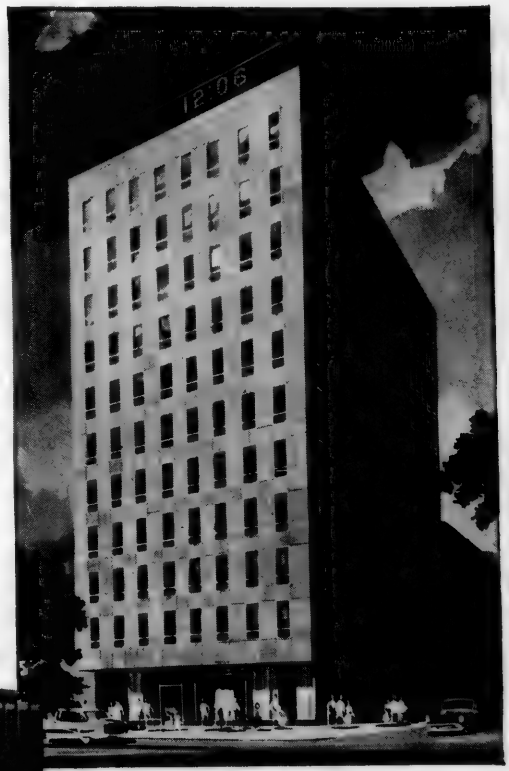
A testimonial dinner for 137 employees of BURNS AND ROE, INC., for those with five or more years of service, was held by the company in the Gold Ballroom of New York City's Hotel Statler. The affair was the start of the newly instituted Service Awards Program to honor employees who reach 5, 10, 15, 20, 25, and 30 year anniversaries with the company. Awards received by 122 men and 15 women were gold or silver lapel buttons, tie bars, tie chains, pendants or pins bearing the company emblem and denoting length of service. Mr. R. C. Roe and three members of the staff who have been with the firm since its incorporation in 1935 received 20-year awards.

(Concluded on page 14)

And for IBM A FUTURE OF FAULTLESS SERVICE

Here are two more examples of the sweeping trend to DELANY flush valves by leading corporations . . . the new IBM World Trade Headquarters Building in New York City and the IBM Office Building, Hartford, now nearing completion.

When equipment specifications are rigidly formulated, when maintenance costs are carefully calculated . . . as in the case of IBM . . . DELANY flush valves deserve the preference they have created. DELANY valves are unique . . . exclusively diaphragm type, all adjustable for job flexibility and water conservation, simple in design for longer performance and painless overhaul. Your next project can be a finer project with DELANY—"the fastest growing name in flush valves!"



IN NEW YORK
HARRISON & ABRAMOVITZ
architects
MEYER, STRONG & JONES
mechanical engineers
TAGGART PLUMBING CO.
plumbing contractor
CRANE CO.
wholesale distributor & plumbing fixtures manufacturer

IN HARTFORD
PEDERSON & TILNEY
architects
HENRI B. van ZELM
mechanical engineer
FREDERICK RAFF CO., INC.
plumbing contractor
WEST HARTFORD SUPPLY CO., INC.
wholesale distributor
RICHMOND PLUMBING FIXTURES DIVISION of RHEEM MANUFACTURING CO.
plumbing fixtures manufacturer

DELANY *Flush* VALVES

Since 1879

COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK

IN CANADA: THE JAMES ROBERTSON CO. LTD.

ONLY

Wing

REVOLVING HEATERS

offer all these advantages

Hot Blasts and Cold Spots Eliminated In Wing Revolving Unit Heaters, the warm air outlet rotates slowly and continuously. This movement of the revolving outlet sets up a gentle air motion which distributes the heat evenly, and eliminates those hot and cold spots caused by stationary heaters.

Because of the constantly changing direction of the warm air, it finds its way around obstructions, such as machinery in manufacturing plants, cars and buses in repair garages, airplanes in hangars, etc.

Fewer Wing Heaters Needed The old concept of unit heaters spaced every 60 or 80 feet doesn't apply with Wing. Wing's largest Revolving Heater, for example, covers over 125′ x 125′.

In a large building this means fewer heaters, much lower installation and maintenance costs. In a building 125′ x 420′, for instance, 4 Wing Revolving Heaters do the job of 12 stationary heaters–without uncomfortable hot blasts or cold spots.

60 Foot Ceilings, And Higher Many thousands of high ceiling Wing Revolving Heaters have been installed where efficiency and comfortable heat are paramount.

Equally Effective with Low Ceilings Wing's line of adjustable discharge outlets provides efficient heating regardless of ceiling height.

Low Outlet Temperature Because of Wing's exclusive heating section design, low pressure heating comfort can be obtained with any steam pressure up to 200 psi.

For complete detailed information on Wing's line of Revolving Unit Heaters contact your local Wing Representative or write our Main Office in Linden, N. J.

L. J. Wing Mfg. Co.

DIVISION OF AERO SUPPLY MFG. CO. INC.

140 VREELAND MILLS ROAD, LINDEN, NEW JERSEY

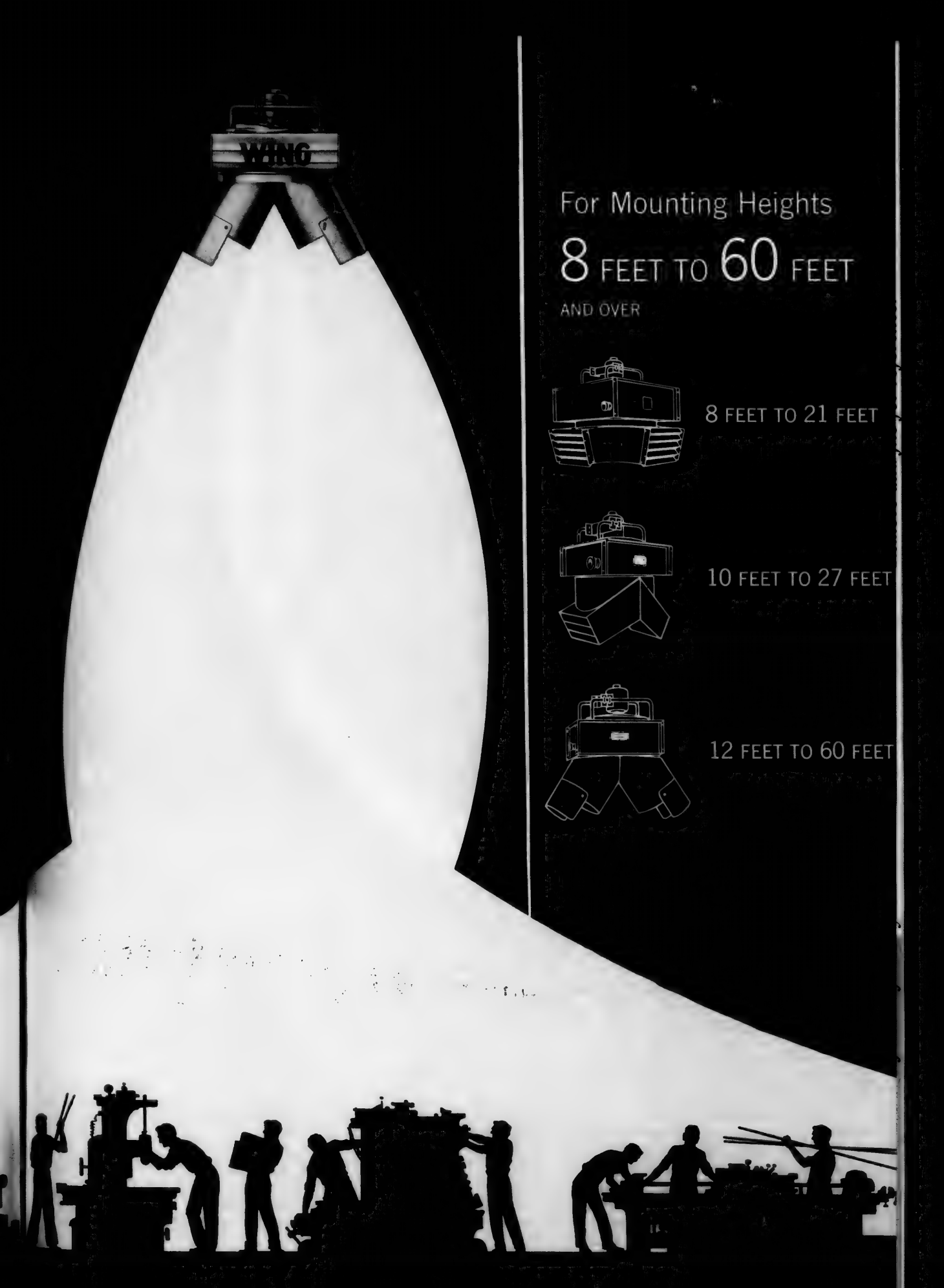
FACTORIES: LINDEN, N. J. AND MONTREAL, CANADA

IN EUROPE: WANSON, HAREN-NORD, BRUSSELS, BELGIUM

OTHER WING PRODUCTS:

- Fresh Air Supply Heaters
- Draft Inducers • Fans
- Turbine and Motor Blowers
- Auxiliary Turbines

WC101



For Mounting Heights

8 FEET TO 60 FEET

AND OVER

8 FEET TO 21 FEET

10 FEET TO 27 FEET

12 FEET TO 60 FEET

BRIEFLY STATED

(Concluded from page 10)

AMONG THE ASSOCIATIONS AND INSTITUTES

J. B. Ogden, general manager, Air Conditioning Div., Whirlpool Corporation, was elected chairman of the new ROOM AIR CONDITIONER SECTION, NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION, New York, N. Y., after having served as temporary chairman since the organization meeting in April. Paul Augenstein, general manager, Room Conditioning Dept., Major Appliance Div., General Electric Company, was elected vice-chairman. The Section, through its General Engineering Committee, is working on development of product standards and test standards. Continuation of cooperation with Air Conditioning and Refrigeration Institute was reported, and for the immediate future, at least, joint NEMA-ARI statistical data will be issued. About three-quarters of the room air conditioner industry's shipments are being reported to the Association . . .

Work of REFRIGERATION AND AIR CONDITIONING CONTRACTORS ASSOCIATION NATIONAL, Cleveland, Ohio, is bearing fruit. The RACCA Labor Committee has been pressing for transfer of mechanics, where qualified as building trades journeymen. Examples are: 260 refrigeration mechanics have been transferred from the Metal Trade Division to a newly formed Refrigeration Division in the local Steamfitters Union of Pittsburgh, Pa.; and a Refrigeration Division of the local Steamfitters Union of Indianapolis, Ind., was recently formed, to which refrigeration men in the metal trades branch of that local union could be transferred.

BOURGENING BUSINESS

WEIL-MCLAIN CO., Michigan City, Ind., manufacturers of cast iron boilers and radiation, has opened a new research and engineering laboratory at the company's headquarters. The Laboratory is completely equipped for extensive hydronic research. Research will include not only those investigations which have to do with the mechanical efficiency of heating and cooling equipment, but also with the relative effects on human comfort of radiant and convected heat and various cooling techniques and applications, the company announced . . .

HERMAN NELSON DIV., AMERICAN AIR FILTER CO., INC., has purchased a five-acre tract adjacent to its 25th Street plant in Moline, Ill., for future expansion . . .

WITH THE MANUAFCTURERS

Three engineering appointments have been announced by NIAGARA BLOWER COMPANY: Louis F. Prossen at the Buffalo, N. Y. plant, William R. Hollinger in Philadelphia, and Tom L. Larson in Baltimore. Mr. Prossen, whose work will be concerned with manufacturing and development, comes from the Celanese Corporation where he was manager of manufacturing. Mr. Hollinger will be concerned with application engineering and sales. He comes to Niagara from the York Corporation. Mr. Larson has been with Ingersoll-Rand and will represent Niagara as district engineer in Baltimore and Washington . . .

Buffalo Forge Co., Buffalo, N. Y. announced the election of two directors to fill vacancies on the Board. They are Theodore M. Dillaway, now secretary and assistant vice-president, and George B. Kellogg, assistant production manager and vice-president . . .

The new line of TRANE COMPANY residential air conditioning equipment will be officially called "Climate Changer." The name was selected from nearly 1,000 submitted by La Crosse and field personnel in a naming contest. Six participants submitted the winning name. Although the name "Climate Changer" has been associated with Trane and certain lines of equipment for several years, by using it to describe its residential air conditioning products, the company is, in effect, extending the name to include the new lines . . .

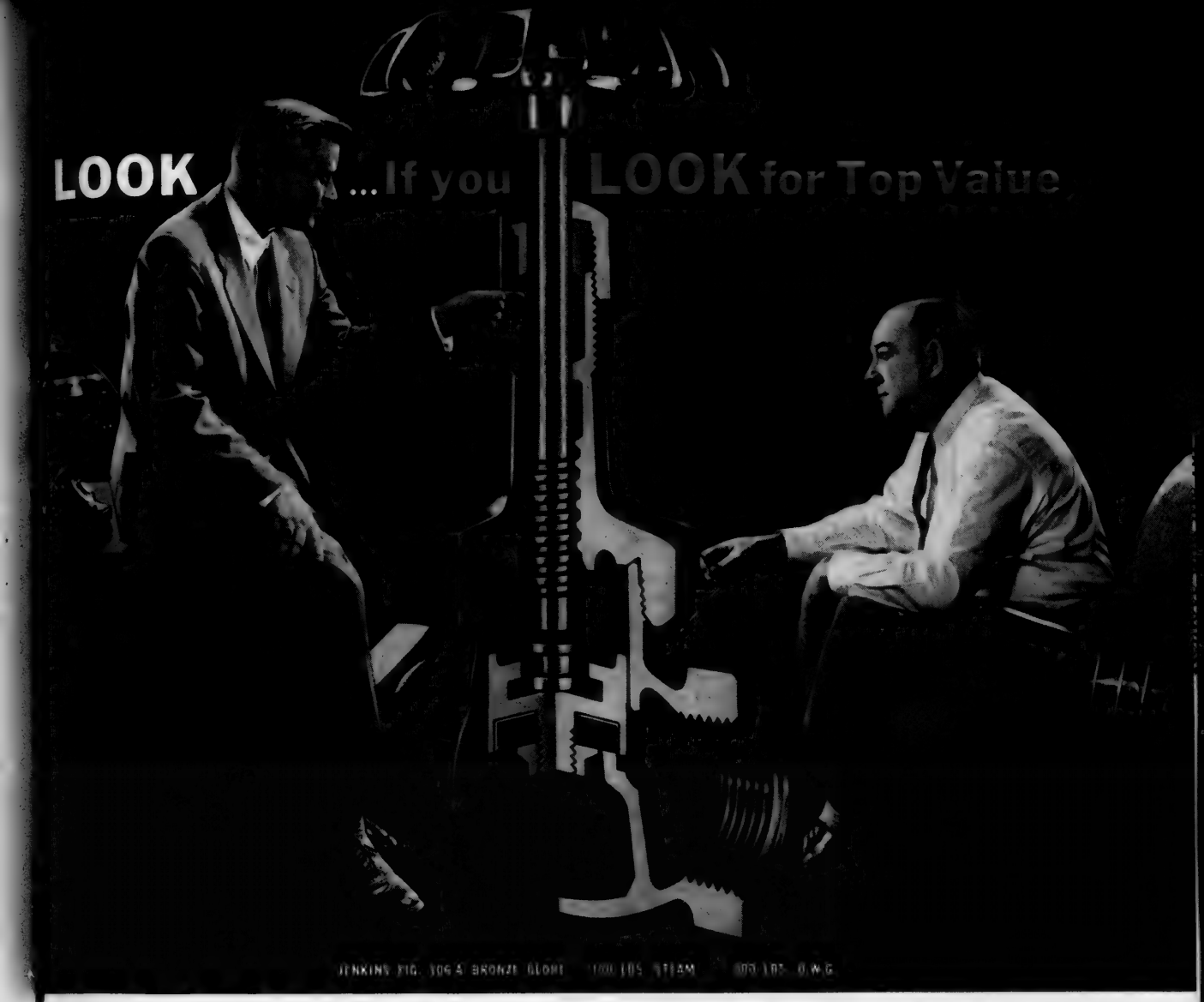
Lee M. Ragsdale, Jr., has been appointed representative for Petrometer Corporation, Long Island City, N. Y., in the Greater Knoxville Trading area covering Eastern Tennessee, including Oak Ridge and Chattanooga and the western corner of Virginia. He will handle the company's complete line of liquid depth indicators and controls, specific gravity indicators and manifold valves. Mr. Ragsdale's office will be located at 5809 Westover Drive, Knoxville, Tennessee . . .

RIC-WIL, INCORPORATED, Barberton, Ohio, supplier of prefabricated underground piping systems, announces the appointment of Edward L. Logrbrinck as director of marketing. Mr. Logrbrinck, with extensive training in management, engineering, and sales, is a registered professional engineer, qualified in the civil and industrial fields of engineering. In addition to market and product research, his new assignment will include coordinating and directing the over-all sales program of the company . . .

Appointment of Richard H. Fogarty of Philadelphia as pipe welding engineer was announced by the Tube Turns Div., Chemetron Corporation, Louisville, Ky. Mr. Fogarty, whose headquarters are in New York, will work with contractors, engineers and users of industrial piping in the solution of welded piping problems, and will be associated with the firm's field program for training qualified pipe welders . . .

Two recent additions to the Dunham-Bush sales staff are David W. Brown, Bridgeport, Conn., and William Murphy, Boston, Mass. Mr. Brown will handle heating and cooling products in the Bridgeport area. He has worked for G. A. Fuller Co., N. Y. C., as project engineer and A. I. McFarlan Co., also N. Y. C., as sales engineer. Mr. Murphy, who will handle cooling products in the Boston area, served the Bay State York Co., Brookline, Mass., as chief engineer . . .

Old Dominion Iron & Steel Corp., Belle Isle, Richmond, Va., announces several appointments of representatives in New Jersey, New York, and Connecticut. They are: Parker Devlin Agency, P.O. Box 392, Westport, Conn.; Plasse Industrial Co., 30 Church St., New York, N. Y. (for Metropolitan New York and Long Island); and Merit Steam Specialties and Sales, P.O. Box 113, Verona, a suburb of Newark, for Northern New Jersey.



in Disc Equipped Bronze Valves

LOOK at that Wheel — Tough malleable iron. Design unequalled for cool, sure grip.

LOOK at the Index Plate — Has Fig. No. etched in green background. Held by wheel nut which is secured by rolled-over spindle end.

LOOK at that Spindle — Made of high tensile bronze. See how much heavier it is . . . how many more deeply cut threads engage bonnet. And, the crowned head that reduces friction on disc holder. Sure, it costs more to make a spindle this way. But it reduces wear, preserves packing, means easier operation.

LOOK at the Packing Nut and Gland—Note the heavy and deep bronze hex. And, that bronze gland designed to compress packing toward spindle.

LOOK at that Packing Box — Its depth equals 1½ times spindle diameter. More packing space means less repacking. An asbestos, lubricated and graphited packing is used.

LOOK at that Bonnet — One-piece, screw-over design with big hex surfaces is easy to remove. Take an extra look at the bevel joint between bonnet and body, serving as an internal brace against the crushing effect of the bonnet assembly. Millions of Fig. 106-A in use for years prove this unique design licks distortion and springing.

LOOK at the Disc Holder — It's the Slip-on Stay-on type originated by Jenkins. Correct protective depth prevents flaking or cracking of disc.

LOOK at the Disc — Easily renewed without removing valve from line. Made of compositions to suit various services . . . and **made by Jenkins,** the only maker of both valves and discs.

LOOK at that Body — Just compare wall thickness of this high tensile bronze body with any other valve. The factor of safety is many times higher than rating requires. See the curved diaphragm to protect seat from distortion by pipe strain. Note that the raised seat is higher to permit more reseating operations . . . and wider, so it won't cut into disc. Pipe threads are full length and clean cut.

LOOK at this . . . for Throttling

—Just replace the standard disc nut with this Throttling Nut and a Fig. 106-A becomes well-suited to throttling service. This unique nut reduces the effects of wire drawing and its long legs restrict flow for accurate control. Many plants take advantage of this versatile valve to reduce valve and parts inventory.

THE FIRST renewable composition disc valve was a Jenkins Valve, originated nearly a century ago. Compare today's Fig. 106-A Bronze Globe with any other. See why so many valve users agree that a *Jenkins* is still the FIRST for top value. For descriptive folder No. 189-B on the full line of Jenkins Bronze Globe, Angle and Check Valves write to Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES

Scientific Frontiers

• Data obtained from Sputniks I and II provide grounds for the conclusion that temperature of the atmosphere at altitudes around 140 miles is higher than was formerly supposed on the basis of theoretical considerations. This discovery confronts geophysicists with the problem of the powerful sources of energy which heat the atmosphere. Known ultra-violet and X-ray radiation of the sun is hardly sufficient for what seems to exist. At present, only various hypotheses can be advanced. It may be assumed, for example, that the upper atmosphere in the Arctic regions is intensively heated by solar radiation of minute particles. It is possible that in general the entire upper atmosphere is additionally heated either by infrasound waves coming from the troposphere or by electric currents arising in the electrically-conductive ionized air as a result of its movement in the earth's magnetic field.

• Microbes such as those which cause illness and also provide antibiotics for combatting disease are being studied by the Bureau of Mines as potential aids in recovering valuable metals from low-grade ores, for producing synthetic liquid fuels from oil shale, and for studying the structure of coal. Promising recoveries of copper, nickel, cobalt, and other metals already have been obtained at the Bureau's Eastern Experiment Station in College Park, Md., by the action of bacteria mixed with small samples of low-grade ores. These bacteria, which oxidize sulfur to acid, have enabled researchers to obtain many times the metal recovered in control experiments without bacteria. Meanwhile, research at Bruceton, Pa., is furnishing information on bacteria, yeasts, molds, and other minute life forms in coals, and on the biochemical action of bacteria on chemicals found in coal.

• Instead of a metal can, packages in which food and other supplies will be packed for space travel will probably be made of vitamin-loaded chemical films. Containers, instead of being thrown away, will be eaten, used as plant food, or converted through some means into useful gases or some other product. Pointing out that films used today on wieners are digestible, Albert Olevitch of Air Materials Laboratory, Wright Air Development Center, Ohio, speaking to members of the Society of Industrial Packaging and Materials Handling Engineers, stated that every ounce of material taken on a space flight must be made as useful as possible.

• Effects of earthquakes on nuclear power reactors is the subject of a year-long study to be conducted by Lockheed Missile Systems Div., Palo Alto, Calif., and Holmes & Narver, Inc., Los Angeles engineering and consulting firm. The study is expected to evaluate earthquake hazards to major types of stationary reactors and to develop criteria for inclusion in design requirements to minimize or eliminate such hazards. Results of the study will be published in an Atomic Energy Commission handbook for the guidance of industrial firms interested in the design and construction of large reactors.

• The development of boilers capable of generating steam efficiently by burning a new type of low-volatile "char" is reported by The Babcock & Wilcox Co. Ability to burn the char provides a fuel that can be marketed at prices which are favorably competitive with those of raw coal, as well as making it economically feasible for coal processors to employ the latest technological developments for extracting tars and chemicals from the raw coal. Although other removal processes are now in commercial use, they produce premium fuels for utilization either in the steel industry or as smokeless household fuels. Char obtained from the new processes is not a premium fuel and therefore can be used economically for power generation. Estimates by coal authorities place the value of the tars, chemicals, and gases which may be removed as equal to that of the coal itself.

DATA SHEET NO. 3

Why to specify the Field Triple-Fuel M+MG2 Draft Control for industrial gas-fired furnaces and boilers

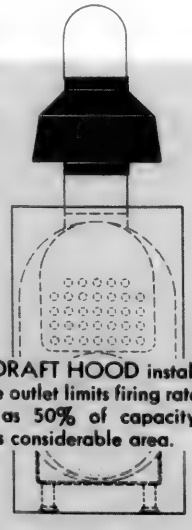
For efficient gas-fired operation, an all-fuel industrial furnace or boiler needs the draft assistance of a chimney, with the draft precisely controlled and fully adjustable. A draft hood cannot provide this, but the Field M+MG2 can. Here is a preformance comparison:

FIRING RATES: A draft hood, installed at the smoke outlet, reduces draft in the breeching to essentially zero. To avoid incomplete combustion, the furnace or boiler must therefore be gas fired at a rate substantially below capacity — frequently 50% less. As a result, the equipment must be oversized in order to meet load requirements. In contrast, the Field M+MG2 permits draft settings as low as .002" and as high as from .2" to .5", depending on size, permitting a full range of firing rates.

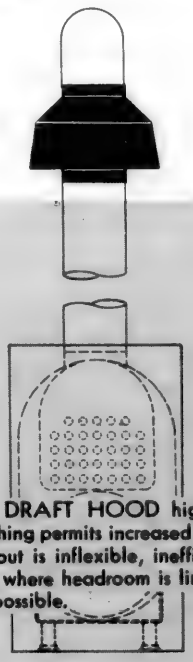
DRAFT LOSSES: A draft hood can be installed in the breeching, at sufficient height to develop a high draft, and permit a high firing rate. However, the hood cannot control draft. As a result, any position that provides enough draft for intermittent firing will produce an excessive draft during prolonged high-fire periods. The result is to dilute gases, and thereby waste fuel. In contrast, the Field M+MG2 can be adjusted to hold drafts at a precise setting under all conditions.

SPACE REQUIREMENTS: Even a comparatively small smoke outlet — a 12" diameter — requires a draft hood 25¼" x 24" x 20", and an inflexible requirement as to location. This bulk can present a serious problem. The 12" Field M+MG2, in contrast, occupies only a 13¼" x 15⅛" area and permits a wide range of approved locations.

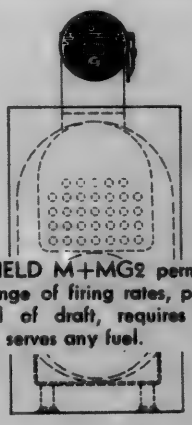
CHANGING LOAD REQUIREMENTS: Draft hoods permit no real flexibility in firing rates to meet changes in load requirements. The installation of a diverter at the smoke outlet automatically limits firing rates, and the diverter installation must be moved or restricted to permit an increase or decrease in efficient firing rates. In contrast, the Field M+MG2, provides for settings as low as .002" and as high as .5", permitting the maximum range in firing rates.



1 — DRAFT HOOD installed at smoke outlet limits firing rate to as little as 50% of capacity, occupies considerable area.



2 — DRAFT HOOD high in breeching permits increased firing rate, but is inflexible, inefficient, and, where headroom is limited, is impossible.



3 — FIELD M+MG2 permits a full range of firing rates, precise control of draft, requires little space, serves any fuel.

The fourth alternative, a direct connection into the stack, with or without a manual damper, is in direct violation of most city and gas utility codes, because of obvious hazards. It is also extremely inefficient.

Remove and file for reference.

Perforated for easy tear-out.

GAS-OIL FIRING: Wherever a gas installation must be altered, to handle oil as an alternating or stand-by fuel, a draft hood is immediately obsoleted, and so, in fact, is a single-fuel barometric draft control. Only the M + MG2 Field Triple Fuel Control is approved for all fuels.

SWITCHES: A draft hood provides relief for down draft pressures, but gives no visual sign of spillage. The double-acting M + MG2 gate opens outward to relieve such pressures, and by its position signals any spillage. In addition, the M + MG2 can be equipped with an automatic switch where the engineer finds conditions which could create frequent and prolonged down drafts. A time delay switch is usually recommended for an atmospheric burner; a thermal switch for a power burner. These switches provide an obvious means to measure the extent of a down draft problem so that an engineer can judge if and when some remedial action is indicated.

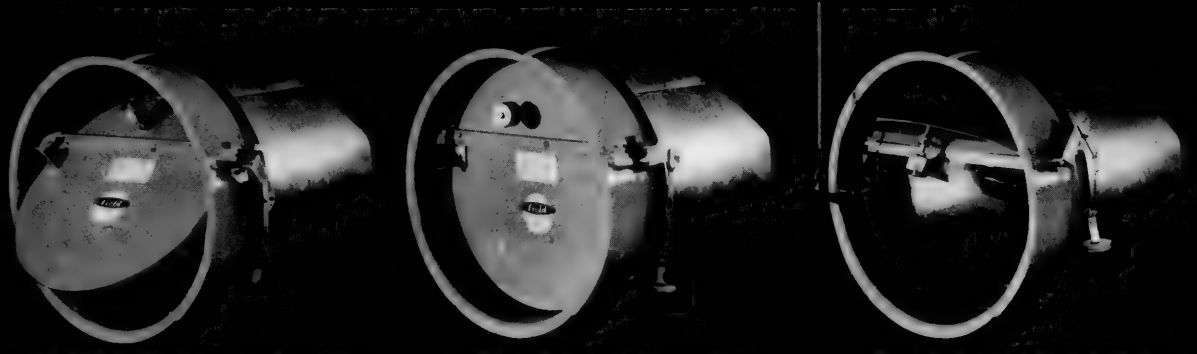
SPILLAGE: A cause of recurrent spillage, where a draft hood is used, is loss of prime resulting, during off-fire periods, from the abrupt cooling of the stack by an unrestricted volume of boiler room air. Then, when the burner comes on, there is a spillage of gases until the chimney is again fully primed. This condition is aggravated by a low stack, or a prolonged off-fire period. The Field M + MG2, in contrast, does not introduce any boiler room air into the stack until or unless draft is in excess of requirements, and therefore the chimney does not lose its prime between normal industrial firing periods.

APPROVAL REQUIREMENTS: The M + MG2 is Listed by Underwriters' Laboratories as a single-acting control for solid fuels and oil, and as a double-acting control for gas. It has the approval of America's leading gas utilities, and of America's leading cities where codes apply.

A CONTROL OF UNMATCHED QUALITY: Recognizing that gas is a critical fuel, the M + MG2 is built to maximum standards, and is virtually impervious to wear. The ring is die-formed, for maximum strength. The gate is the heaviest made — 39 pounds for a 32 inch control — and is mounted on a stainless steel knife edge. The bearings are self-cleaning — soot cannot accumulate, and are self-aligning to distribute wear over a wide area. Thus mounted, the gate is essentially friction-free, providing extreme sensitivity both to internal and external pressures. The Field M + MG2 can be installed with complete and absolute confidence.

Data Sheet No. 4 will cover Field Draft Controls for Incinerator Applications.

THE FIELD TRIPLE-FUEL M + MG2 DRAFT CONTROL



M - MG2 Double Acting for Gas, opens inward to regulate up drafts, and opens outward to relieve internal pressures.

M - MG2 Single Acting for Oil

M + MG2 Barochek for Solid Fuels

FIELD CONTROL DIVISION

H. D. Conkey & Company, Mendota, Illinois

AFFILIATES:
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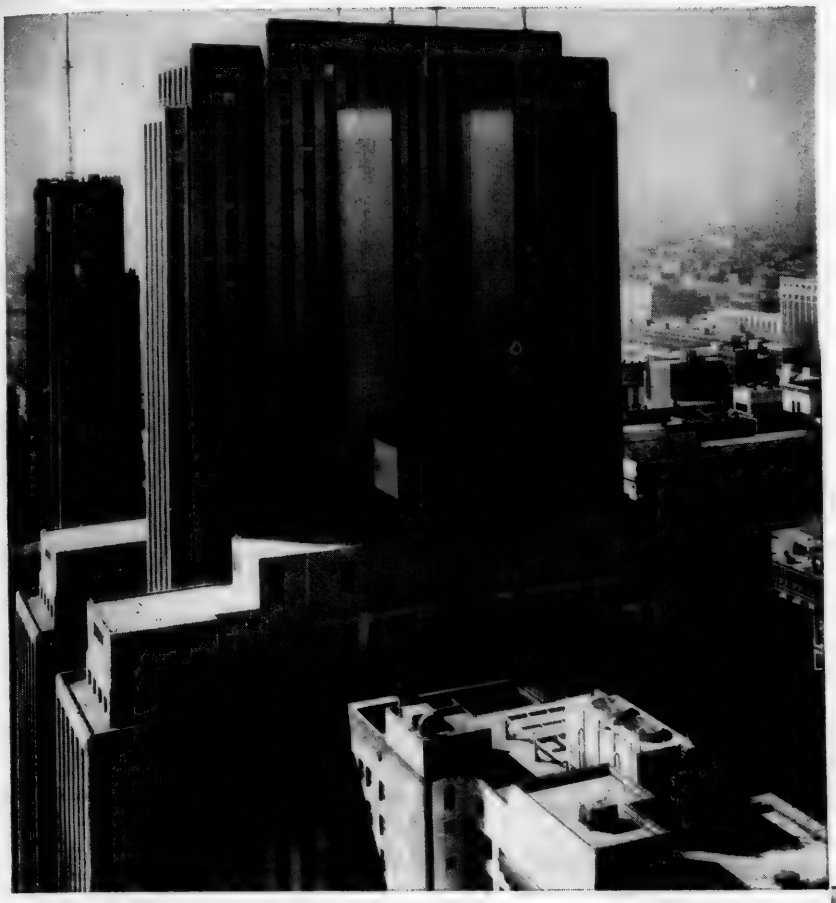
field

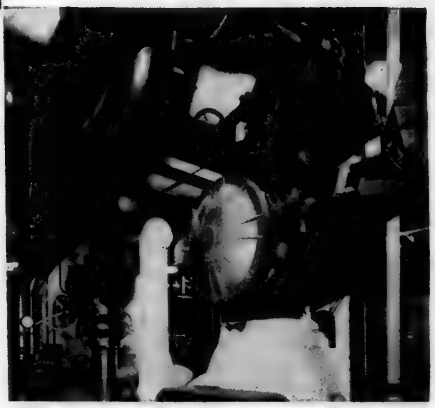


Air Conditioning with

USS National Pipe—

Chicago's Field Building

One of Chicago's landmarks, the towering Field Building on South LaSalle Street, recently completed the installation of a new air-conditioning system. USS NATIONAL Seamless Steel Pipe was used throughout the system—a total of 127 tons of it—in sizes from 3" O.D. to 18" O.D.



Need first-quality pipe for air-conditioning, heating and power installations? Need seamless steel pipe that will pay you back in outstanding service many times over for every dollar you spend? Then just say "NATIONAL Seamless." And, for further information or immediate assistance with your pipe problems, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

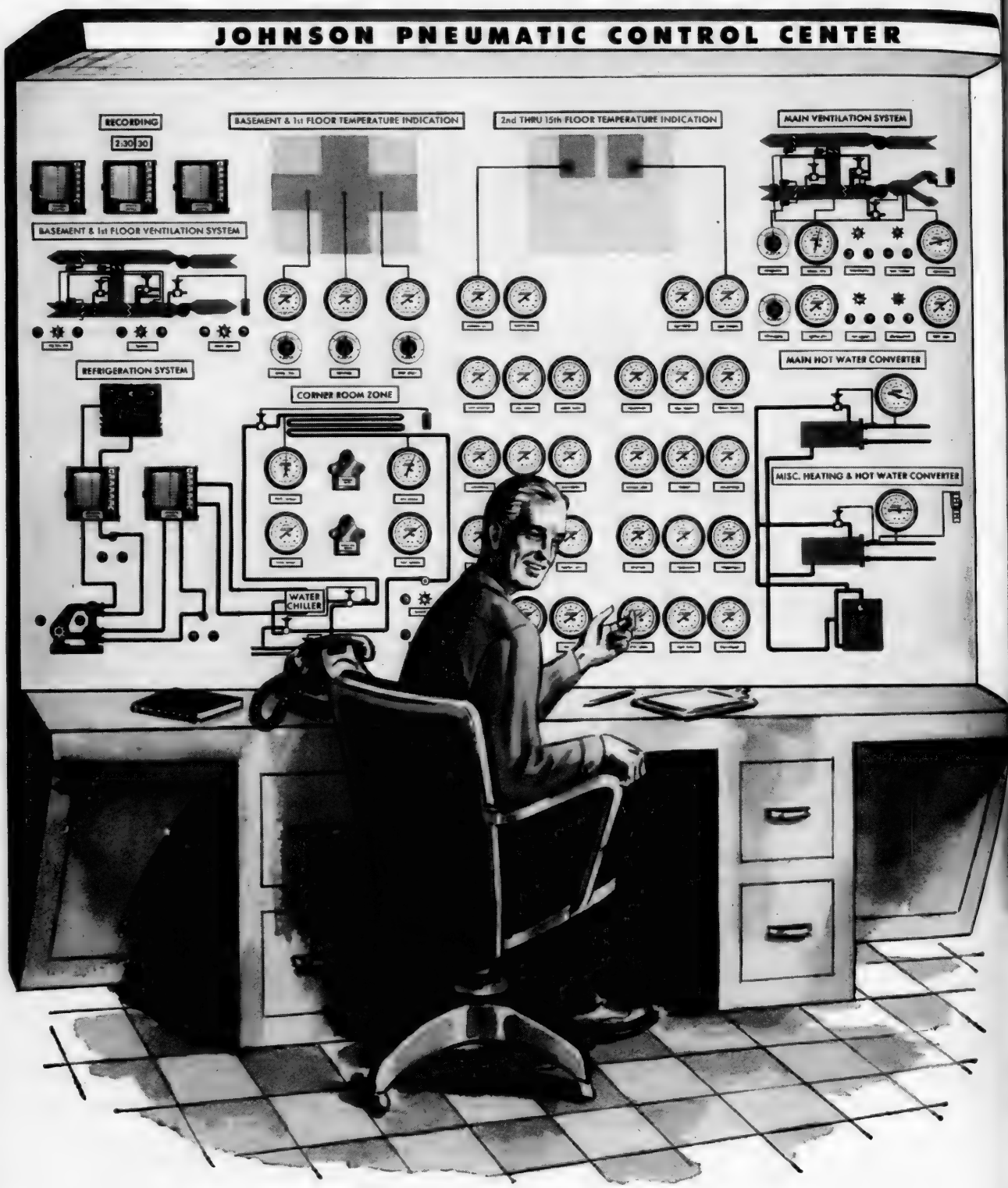
USS and National are registered trademarks

"The world's largest and most experienced manufacturer of tubular products—NATIONAL TUBE"

National Tube Division of USS United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • United States Steel Export Company, New York

See How Much More



Your Clients Get with a

JOHNSON PNEUMATIC CONTROL CENTER

Whatever your reasons for including a control center in a client's building—manpower savings, convenience, greater comfort, special usage and occupancy problems, or longer equipment life—a a Johnson Pneumatic Control Center is the most practical way to get the desired results.

WIDE CHOICE OF FEATURES

Johnson Pneumatic Control Centers are designed with any combination of features required to provide efficient air conditioning operation. These include graphic representation of the air conditioning systems, remote indication of important temperatures and the operation of controlled devices, optional or continuous recording of key temperatures, remote temperature reset and many others.

EXCLUSIVE ADVANTAGES

The pneumatic control center not only does everything you and your clients expect of a control center, but it offers other important, *exclusive* benefits, as well.

EASIER TO OPERATE AND MAINTAIN

With pneumatics, you simplify the complex. You use fewer components. Being pneumatic, *the components of the control center itself are just as simple as the pneumatic controls used elsewhere in the building!* That means operating personnel can quickly and easily understand the operation of even the largest pneumatic control centers without extensive instruction and study. Pneumatics also simplifies maintenance.

ONE GLANCE TELLS ALL

Remote temperature indication is a basic part of all control centers. However, only the pneumatic control center gives *continuous* indication of key temperatures, such as outdoor air, hot and chilled water, fan discharge and dew point temperatures and temperatures in spaces subject to special usage or occupancy problems. With a separate pneumatic thermometer for each key point, the entire system can be checked with a single glance! Any need for adjustment shows up instantly without waiting for periodic checks.

Control pressure gages provide for continuous remote indication of the operation of the controllers and position of controlled devices. This exclusive pneumatic feature adds tremendously to ease and efficiency of operation.

NO SERVICE PROBLEMS

Likewise exclusive with pneumatic control centers is the vital assurance of nationwide service by full-time, factory-trained temperature control experts. There's no need to ask a client to take his chances on service, for Johnson Pneumatic Control Centers are backed by the oldest and largest service organization in the control industry.

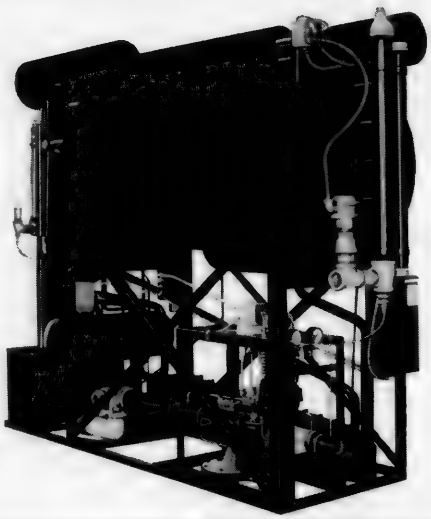
Johnson is presently making and installing Control Centers for buildings of all types and sizes. For more information about their advantages or recommendations on your specific problems, call a nearby Johnson engineer. Johnson Service Company, Milwaukee 1, Wisc. Direct Branch Offices in Principal Cities.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

ARCHITECT: JOHN F. STANN; CONSULTING ENGINEER: J. B. WYBLE; BUILDER: SAM EIG



Check these facts about the 25-ton **Arkla-Servel** Cooler

- A compact unit, easy to install and light enough for rooftop installation.
- Costs are low for installation, operation and maintenance. No specially trained operating or maintenance personnel are required.
- Can be installed singly or in banks to fit any size installation.

"...now we're cooling with GAS!"

Arkla-Servel Gas Air Conditioning keeps customers cool and operating costs down at the Motel Washingtonian

"While we were planning the Motel Washingtonian, we made a complete study of all potential equipment," states Sam Eig, builder and corporation president of this modern motel near Washington, D.C. "We knew we wanted gas for cooking and heating, and after our investigation, we found gas best for *all* operations."

For air conditioning, the specifications called for Arkla-Servel gas absorptive coolers. "With our Arkla-Servel units, we have no maintenance problems," adds Mr. McKeever and Mr. Eig. "And we were able to tie them into our heating system without worrying about special housing, vibration, or noise. Our one central system cools in summer, heats in winter to provide us with a quiet, year-round economical operation."

With the new Arkla-Servel gas absorptive cooler, your clients get extra—even exclusive—advantages that only a gas cooling system gives.

- High efficiency at all times—even during the light loads.
- Constant temperature control.
- Instant automatic adjustment to match actual cooling requirements.
- Dependability of fuel service at all times.

Gas absorptive cooling can put your commercial and industrial clients' heating plant on a year-round paying basis, too. For specific information, take advantage of the consulting services provided by your gas company. They have trained specialists who have been working with architects and engineers for years. Check the facts about gas and you'll see—modern gas air conditioning out-performs all other fuels. *American Gas Association.*

Giant Computers are made here

Architect: **L. Rossetti**
Engineers: **R. F. Giffels and V. E. Vallet, Detroit, Mich.**
Contractors for heating and air conditioning:
Rowland Tompkins & Sons, Hawthorne, N. Y.
Carrier Corporation, New York City—subcontractor

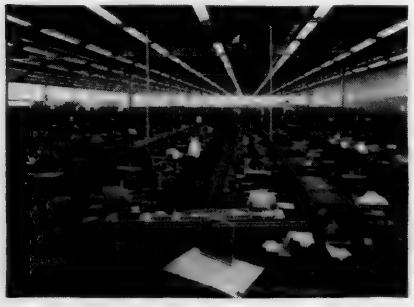
INTERNATIONAL BUSINESS MACHINES CORP. MILITARY PRODUCTS PLANT, KINGSTON, NEW YORK

Focal point of the SAGE Air Defense System is the round scope portion of Display Console shown in photo at right. It can depict the over-all battle or focus on part of it. Powers Precision Control of Temperature and Humidity is important in all spaces shown here at the IBM Kingston Plant

One of the SAGE Air Defense System Display Consoles.

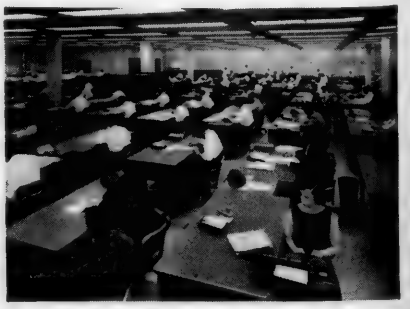
Input frames (front view) thru which all radar information is processed.

View of Pluggable Unit Assembly department.



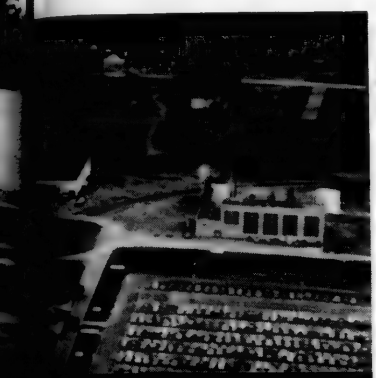
One of many Quality Control areas.

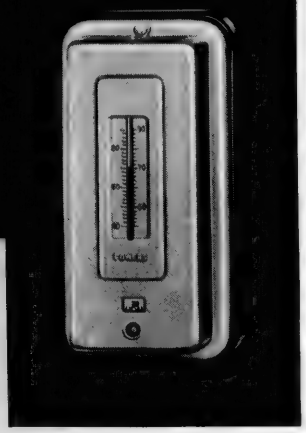
View of Manufacturing-Engineering department.



where Employees both THINK and work better in proper Thermal environment provided by

POWERS AIR CONDITIONING CONTROL SYSTEMS





Symbol of Quality Control and Economy

In this big modern IBM plant at Kingston, N.Y. are produced the world's largest electronic digital computers, which mastermind the famous SAGE Air Defense System. In minutes the system can detect a foe approaching by air, determine its course and even guide an interceptor to meet the attacker. SAGE is a masterpiece of automation.

The SAGE computer comprises over 200 separate units, occupying floor space equal to 24 average ranch style homes. It uses as much power as a town of 15,000 and it generates an immense amount of heat. Proper cooling is important.

Accurate control of temperature and humidity by Powers in this completely air-conditioned plant helps employees THINK better and produce better quality products. Central Fan Systems supply proper year 'round conditioned air for the varied types of activity in these spaces: engineering, manufacturing, test areas, laboratories, offices, classrooms and cafeteria. Perimeter areas of the building are heated with silline hot water radiation regulated by Powers master-sub-master control systems.

Powers Process Controls also are used at IBM for accurate temperature control of dryers, metal plating and finishing, photo film developing, heat treating, and shower baths.

Are You Planning a New Building or modernizing an old one? Solving the complex temperature, humidity and pressure control problems at IBM demonstrates Powers engineering skill and know-how.

When you specify Powers Quality Controls, you ensure for yourself and your clients TOP QUALITY—there is no better!

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico*

65 Years of Automatic Temperature and Humidity Control

(C57e)

In 4 special SAGE Computer test areas are dehumidifiers (above), a central control panel (right), and dry air coolers (left). On the latter, fluid drive variable speed control is operated by a 6" Powerstroke motor controlled by Powers Static Pressure Regulator and Submaster K Thermostat.

NATION ENDORSES

ttsburgh Firm nnounces New letal Discovery

ITTSBURGH (AP) — A M Byers put on the market today a new d of wrought iron described as most significant development in history of the metal.

his description was given at a vs conference yesterday by B. M. ers, president of the Pittsburgh n It is the world's largest maker wrought iron products.

he improved product, known as) wrought iron, is at least 25 per st [illegible] to corrosion

Firm Producing Corrosion-Proof Wrought Iron

A new 4-D wrought iron has been announced by the A. M. Byers Co., Pittsburgh, according to E. G. Sullivan, field service engineer here for the firm.

Byers, largest producer of wrought iron, claims the new iron has greatly superior resistance against many kinds of corrosive forces, including [illegible]

lew Wrought ron Produced

A new 4-D wrought iron" n 25 per cent increased rosion resistance has been ought out of the laboratory into production by the M. Byers Co., William E. ager of Seattle, Byers field rvice engineer, said Sunday. Weber said 4-D wrought n is immediately available

4-D PIPE — R. R. Kirkwood (left), Chief Mechanical Engineer for John Graham & Company, Seattle, checks piece of 4-D Wrought Iron Pipe now being produced by A. M. Byers Co. Looking on is Byers' Seattle Field Service Engineer, W. E. Weber.

A. M. Byers Claims Improved Wrought I Less Likely to Corrod

By a WALL STREET JOURNAL Staff Reporter

PITTSBURGH—A. M. Byers Co., a prod of wrought iron products, announced its m lurgists have come up with a new and proved version of standard wrought iron.

Called 4-D wrought iron, simply a mark term used to distinguish it from the stan product, it is expected to "aid substanti in reducing losses stemming from mat failures caused by corrosion, B. M. president, stated.

He said that standard wrought iron ready "a bulwark in the fight against sion." Wrought iron pipe, for instance, in water, waste and drainage lines, locom and diesel engine piping and underground plane fueling lines, while flat rolled pro go into coal chutes, bridge decking, pier tection plates, structural members and pr materials tanks.

A. S. Chalfant, vice president-sales, s new product will go on the market imm ately. He added that the new product wi for the same prices as those for st wrought iron.

A. M. Byers Announces Results Of Tests On New 4-D Wrought Iron

PITTSBURGH, Mar. 18. — Results of three tests new 4-D wrought iron have been announced by the etallurgical department of A. M. Byers Company, ttsburgh. The test data documents the announcement made by A. S. Chalfant, vice president of sales, a press conference in ttsburgh in February at new 4-D wrought iron at least 25% more cor-

gion is characterized by agitation and plentiful oxygen."

Test Conditions

Byers Improves Its Wrought Iron

Special to World-Telegram and Sun.

PITTSBURGH, Feb. 13.—A. M. Byers Co., producers of wrought iron products, announced its metallurgists have found a new and improved version of standard wrought iron.

Called 4-D wrought iron, as a marketing term used to distinguish it from the standard product, it is expected to "aid substantially" [illegible]

Develop Ne Wrought I

PITTSBURGH, M. Byers Co., a p rought iron produ ounced today its me ave come up with a mproved version of rought iron.

Called 4-D wrou mply a marketing t distinguish it fr tandard product, it is "aid substantially" ng losses stemming fr

A. M. Byers Co Develops New Wrought Iron

Dow-Jones Service

PITTSBURGH, PA., Feb. 13 [illegible] Byers Company, produc wrought iron products, announced its metallurgists ha come up with a new and version of standa wrought iron.

Called 4-D wrought iron, sim marketing term used to dist guish it from the standard pr t, it is expected to aid s substantially in reducing los stemming from material failu es caused by corrosion, B. M. s, president, stated.

A. S. Chalfant, vice preside [illegible] said the new product

Civil Engineer C. E. Drummond (left), examines 4-D Wrought Iron sponge ball with J. A. Cain, A. M. Byers Company southeastern division manager. Laboratory

Developed By Byers

New Wrought Iron 25 Per Cent More Corrosion Resistan

250,000 Non-Rusting Fibers Per Square Inch In Product

By W. L. RUSSELL, Press Business Edit

Out of the laboratory and into production Byers Co. has come a new type of wrought i is credited with increasing corrosion resis much as 25 per cent.

The new 4-D is a result of 17 years of re

In addition to superior resistance to corr new iron has greater uniformity and improved

4-D WROUGHT IRON

M. Byers Co. Markets Kind of Wrought Iron

...—A. M. Byers wrought iron, developed after 17 ... the market today a ... years of research, has greater ... of wrought iron de- ... uniformity and better physical ... the most significant ... and mechanical properties. ... in the history of the ...

The key to manufacture of 4-D ... scription was given at a ... wrought iron is removal of more ... ence yesterday by B. ... oxygen from the base metal—

...key, General Superintendent of Motive ... & Ohio Railroad, gets a first hand ... R. G. Angell (left), A. M. Byers Co. Railroad ...ager, on the increased corrosion resistance ...D Wrought Iron. Byers recently announced a ...rovement in wrought iron which makes the ... least 25% more corrosion resistant than ... wrought iron. Railroads are among the world's ...rs of corrosion resistant wrought iron.

Byers Making New Wrought Iron

...t significant development ... of wrought iron ... new 4-D wrought ... just been announced ... Company.

...conference Tuesday in ... B. M. Byers, president ... which is the world's ... of wrought iron ... newsmen:

...condensates.

According to E. P. Best, Byers chief metallurgist, the improved 4-D wrought iron was achieved by substantially increasing the deoxidation of the base metal; increasing the phosphorous content in relation to the other material components; and using fiberous material.

...ght Iron More Resistant

...ght iron whose corrosion re... ...increased 25% over standard ... iron is available. Marketed ...e name 4-D Wrought Iron, ... is the result of 17 years ... laboratory and in-service ... uniform di... fiber throug...

Also bec... the metal i... standard w... mechanical ...

4-D wrou...

A. M. BYERS DEVELOP NEW WROUGHT IRO

PITTSBURGH, Feb. 13—(DJ A. M. Byers, Co., a producer o wrought iron products, announced its metallurgists have come up with a new and improved version of standard wrought iron.

Called 4-D wrought iron, simply a marketing term used to distinguish it from the standard product, it is expected to "aid substantially" in reducing losses stemming from material failures caused ... preside...

4-D Wrought Iron Cuts Corrosion

Out of the ...

Corrosion Resistance Raised in Wrought Iron

PITTSBURGH, Feb. 15 (AP) The A. M. Byers Company has announced development of an improved type of wrought iron highly resistant to corrosion.

Known as 4-D wroug... the product is the re... seventeen years of r... the company said.

B. M. Byers, preside... the new wrought iron ... by removin... from the base ... refined iron— ... purer state ...

'New' Wrought Iron Developed

Production by A. M. By... Company, Pittsburgh, P... of a new "4-D wrought iro... with 25 per cent increas...

A. M. BYERS DEVELOPS NEW WROUGHT IRON

A. M. Byers Co., a producer of wrought iron products, announced its metallurgists have come up with a new and improved version of standard wrought iron. Called 4-D wrought iron, simply ... keting term ...

Here is news. It's about one of the most significant metallurgical advances of modern times: the increased corrosion resistance of new 4–D Wrought Iron. This improved metal provides longer service life at lower cost per year. You can get further details from the Byers representative or by writing direct: A. M. Byers Company, Clark Building, Pittsburgh 22, Penna.

...Placed ...

A. S. Chalfan... sales, stated tha... is simply a ma... to distinguish th... from standard w... be placed on t... ately and would... the Byers Comp...

...ROUGHT IRON IMPROVEMENT IS REPORTED

Out of the laboratory and into production has come "new 4-D Wrought Iron" with 25% increased corrosion resistance, A. D. Sheere, A. M. Byers Co. Pacific Coast manager, announces.

Mr. Sheere, of San Franc... recently returned from Pittsb... where he was given a previe... the new material. He says ... Wrought Iron is immediately ... able—at no increase in price— ... will save millions of dolla... corrosion losses annually in ... Pacific Coast territory.

According to Mr. Sheere, ... 4-D Wrought Iron was achiev... increasing the purity of the ... increasing its phosphorous co...

Byers Develops New Wrought Iron

PITTSBURGH, Feb. 13 — A. ... Byers Co., a producer of wrou... iron products, states its me... urgists have come up with a ... and improved version of stand... wrought iron.

Called 4-D wrought iron, sim... a marketing term used to dis... guish it from the standard p...

New Wrought Iron Is 25 Per Cent More Corrosion Resistant

A new type of wrought iron ... developed in the laboratories o... A. M. Byers Co., Pittsburgh. ... now in production. It is cred... ited with increasing corrosion ... resistance as much as 25 pe... cent. The new metal, known a... "4-D" is the result of 17 year...

Byers Improves Wrought Iron

Special to the Herald Tribune

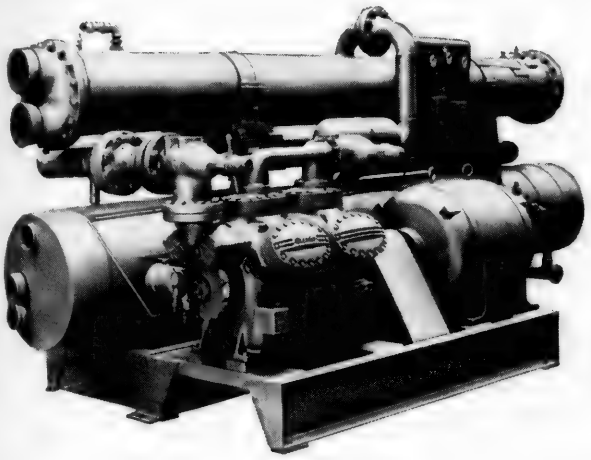
PITTSBURGH, Feb. 12.—A. M. Byers Co. announced today that it had developed a new kind of wrought iron, shown by tests to offer "greatly superior resistance" to corrosion.

Called "4-D," the improved wrought iron was achieved by substantially increasing the deoxidation of the base metal; ... said

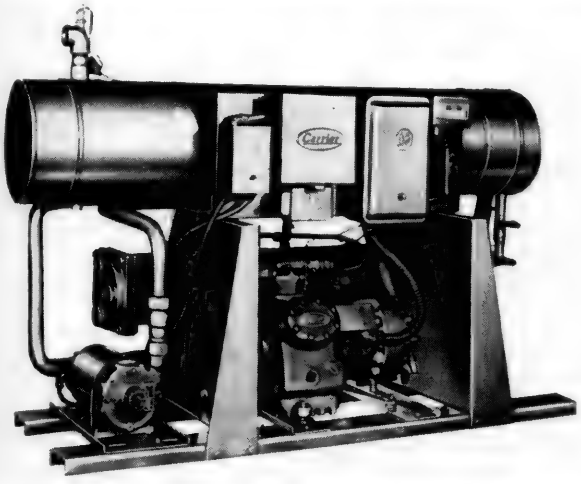
WHICH WATER COOLING MACHINE IS BEST FOR AIR CONDITIONING AND PROCESS REFRIGERATION JOBS?

That depends on the job. Capacity requirements, available space, water supplies and over-all owning and operating costs are important factors in determining which machine is best. Carrier offers a full line of completely packaged water cooling machines with capacities from 5 to 139 tons. All are pre-engineered, assembled and tested for a perfectly balanced refrigeration cycle. Compactness and light weight have been built right into these machines, too, enabling them to go places where others won't. Their initial cost is lower than comparable units assembled from individual components from various sources. And, since they are delivered to the job requiring only simple water and electrical connections, they provide definite savings in installation time and costs. Their advantages are described briefly on the opposite page. For complete information, see your Carrier dealer. Or write Carrier Corporation, Syracuse, New York.

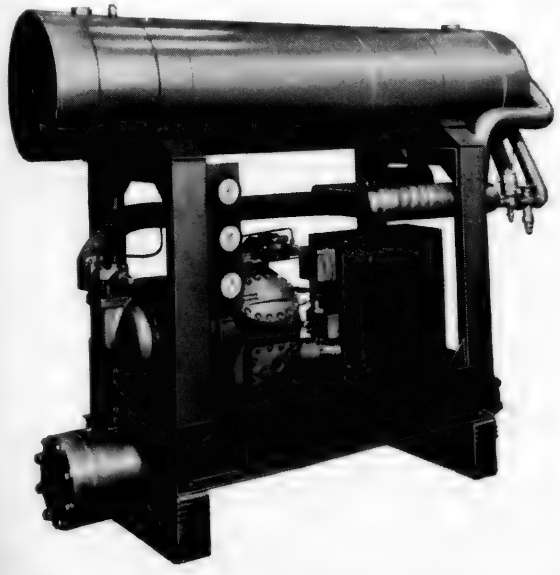
Carrier Air Conditioning · Refrigeration · Industrial Heating



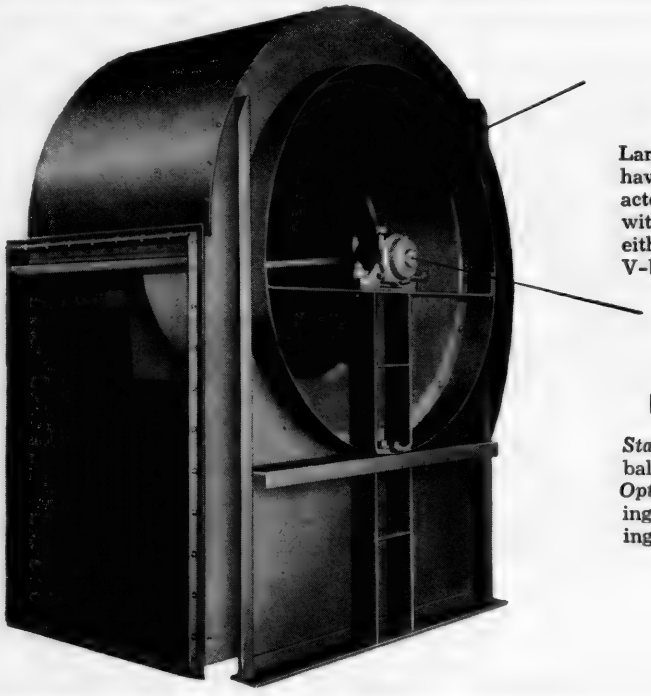
If the job is large, Carrier Model 30C Water Cooling Machines like this will satisfy the cooling requirements of most office and apartment buildings, hotels, hospitals or schools. The entire assembly, including controls, interconnecting refrigerant piping, valves and fittings, has been closely integrated so that the machine will operate with greatest economy. An automatic capacity control saves power by varying compressor capacity in response to cooling load requirements. Capacity range: 85 to 139 tons of refrigeration.



If the job is small, Carrier Model 30E Water Cooling Machines are recommended both as a source of chilled water for air conditioning systems or a source of refrigeration for small process cooling jobs. The units are so compact, light and vibration-free that they can be installed almost anywhere without expensive bases and foundations. For example, the 20-ton model is only 29 inches wide and has an operating weight of only 2300 pounds. Model 30E units are available also for use with evaporative condensers. In 6 sizes with capacities ranging from 5 to 20 tons.



If the job is medium sized, Carrier Model 30K Hermetic Water Cooling Machines offer a dependable, economical solution. No field alignment of the compressor and its driving electrical motor is necessary—both are hermetically sealed in a sturdy, cast-iron casing. A complete control center is included on all units with wiring provided between the motor and its starting equipment and between all installed controls. Capacities range from 25 to 60 tons of refrigeration. If water supplies are critical, other models are available for use with evaporative refrigerant condensers.



HIGH-EFFICIENCY STREAMLINE WHEEL

Large-area, backwardly inclined blades have true nonoverloading power characteristic. Medium-speed operation with minimum fan size is ideal for either direct connection to motor *or* V-belt drive.

CHOICE OF HEAVY-DUTY BEARINGS

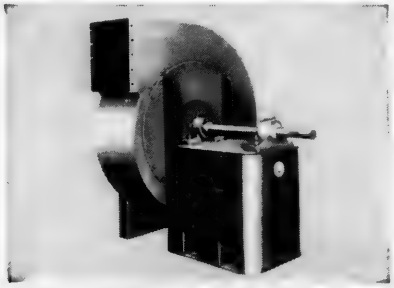
Standard — Heavy-duty, self-aligning ball-bearing pillow blocks.
Optional—Babbitted-sleeve, self-aligning type or roller pillow-block bearings.

American Blower HS Fans hit top efficiency at medium speeds with minimum fan size

Versatile is the word for American Blower fans. For among this complete line of precision-built fans, you'll find an economical solution to *your* air-moving problem — whether it be ventilating, heating, drying or processing. And the heavy-duty construction of every American Blower fan guarantees you many years of low-cost, minimum-maintenance service.

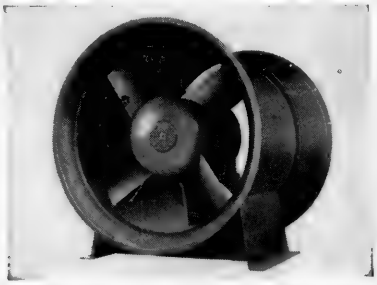
Nationwide, 73 American Blower factory branch offices are ready to serve you. At your request, skilled sales engineers will help select the equipment to handle your air-moving job best within your budget. Call today! American-Standard, American Blower Division, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

It pays to standardize on American Blower fans for every duty!



Industrial Fans — 3 optional wheels handle air, material, long shavings.

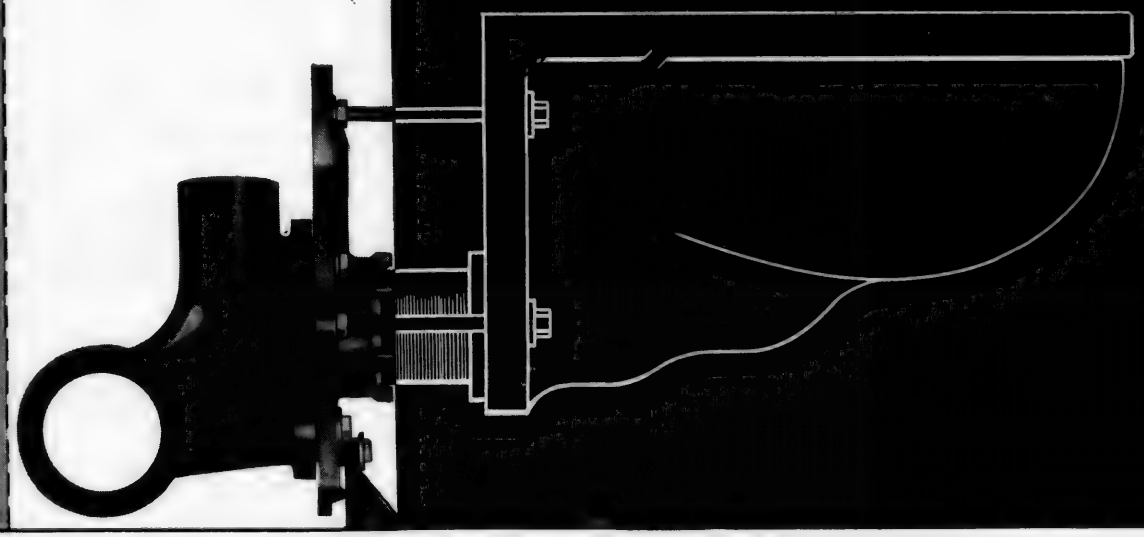
Sirocco Fans — low speed, quiet operation; move more air per revolution.



Axial Fans — move high volumes in minimum space; flexible installation.

AMERICAN-Standard
AMERICAN BLOWER DIVISION

THIN



all-new . . . ZURN THINLINE system®

HERE'S THE "PERFECT" SUPPORT FOR YOUR MODERN, ULTRA-SANITARY WALL-TYPE PLUMBING FIXTURES. It's slimmer . . . stronger . . . easiest to select . . . specify . . . and install. Years-ahead advantages you naturally expect—and always get—from the original developer of *engineered* wall-type plumbing fixture supports.

ALL-NEW, DETAILED CATALOG, TOO. **FREE!** FOR DESIGNERS . . . SPECIFIERS . . . INSTALLERS . . . OWNERS Contains latest minimum space requirements and up-to-date roughing-in dimensions, on the complete line of newly-designed ZURN THINLINE SYSTEMS for supporting wall-type closets, urinals, lavatories and sinks. *Write Now!*

A Step Ahead of Tomorrow

ZURN INDUSTRIES, INC.
PLUMBING PRODUCTS DIVISION • ERIE, PA. U. S. A.

ZURN INDUSTRIES, INC.
Plumbing Products Division
Erie, Pa. U.S.A.

Please send me your new free Manual 60 describing the complete line of modern-engineered ZURN THINLINE SYSTEMS . . . and Form 24-ADV **INDEX** for all manufacturers' fixtures.

NAME_____

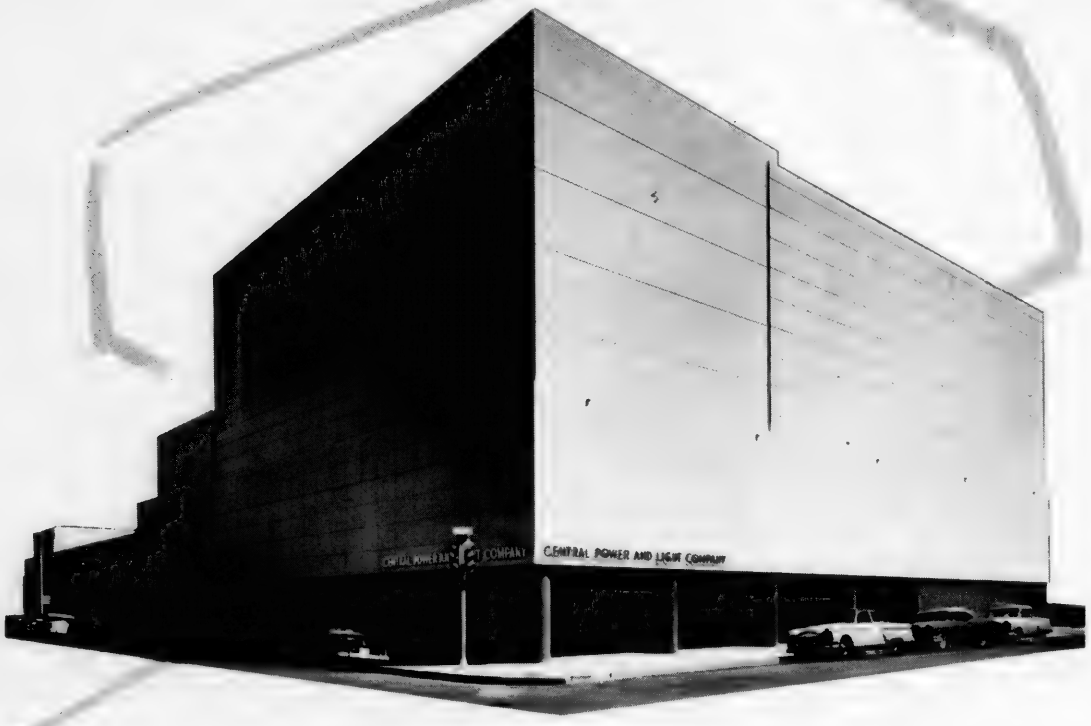
TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

AC-7



WINDOWLESS BUILDING
RELIES ON THERMAL
FOR AIR CONDITIONING and VENTILATION

Eight big, central plant and multizone type Thermal Engineering air conditioning units supply year-around all electric heating, cooling and ventilation for Central Power and Light Company's* remodeled and enlarged five-story building in Corpus Christi, Texas. The building is completely windowless except for street level display panels.

For air conditioning and ventilating equipment that you can rely on for efficiency, long life and economical operation, see your Thermal Engineering agent. The Thermal line includes central plant air conditioners; multizone air conditioners; sprayed coil units; heating and ventilating units; cooling and heating coils and air-cooled condensers.

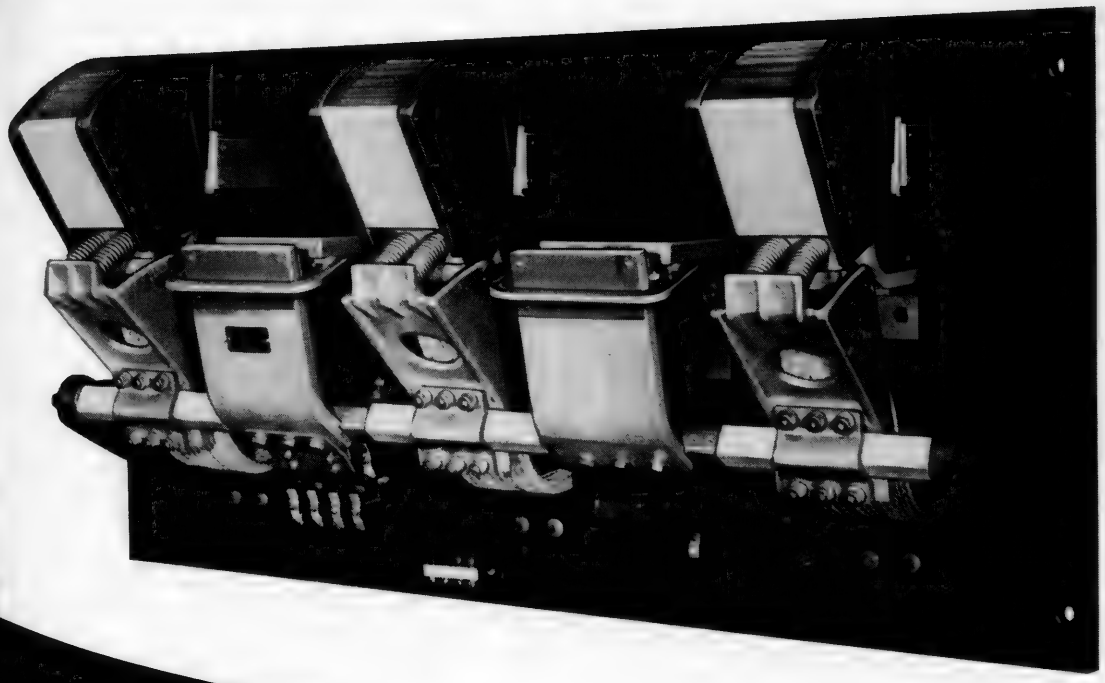
*Robert L. Vogler, Architect
Vincent A. Foote, Mechanical Designer
Texas General Air Conditioning Co., Mechanical Contractors

Manufacturers' Agents . . .
territories open in certain areas . . . write us.

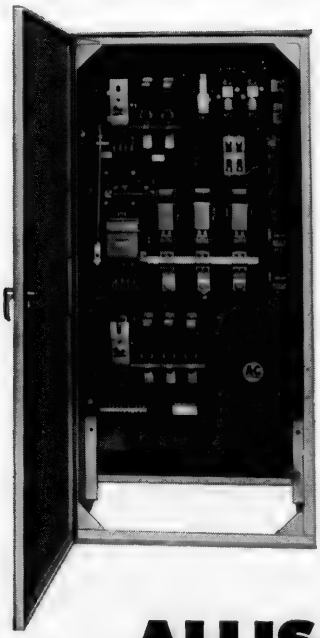
Quality Products Since 1945.

THERMAL ENGINEERING CORPORATION

7605 W. DALLAS • P. O. BOX 13254
HOUSTON 19, TEXAS



Rugged* Simplicity
in air-conditioning motor starters



Simple, durable contactors assure continuous service

ONE look reveals the clean, balanced design of Allis-Chalmers contactors. Fewer parts eliminate many potentially troublesome areas — mean less wear. Simple, solid construction and high interrupting capacity are positive assurance of reliability.

For continuous air-conditioning service during peak summer loads, be sure to get the proven dependability of Allis-Chalmers contactors. It is these contactors that make all 600 volt Allis-Chalmers Size 4-8 reduced voltage starters the reliable performers they are.

Call your nearby A-C sales office or distributor for complete information, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

*7th meaning, Webster's New Collegiate Dictionary, Second Edition.

ALLIS-CHALMERS

A-5783

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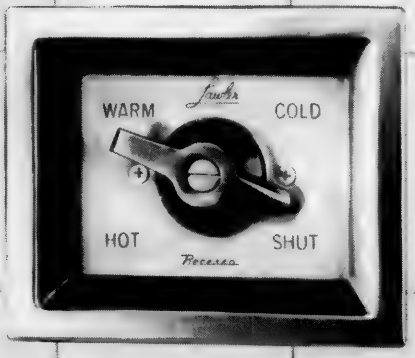
most comfortable showering



WITH THE *Recesso*

THERMOSTATIC SHOWER MIXING VALVE

No protruding edges to hurt her in case she slips and falls ... no chance of accidental scalding in case cold water fails ... she's completely safe, and so is your reputation with the *Recesso*

- For Safety from Bodily Injury
- Safety from Scalding
- Most Luxurious
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Another Quality Product of

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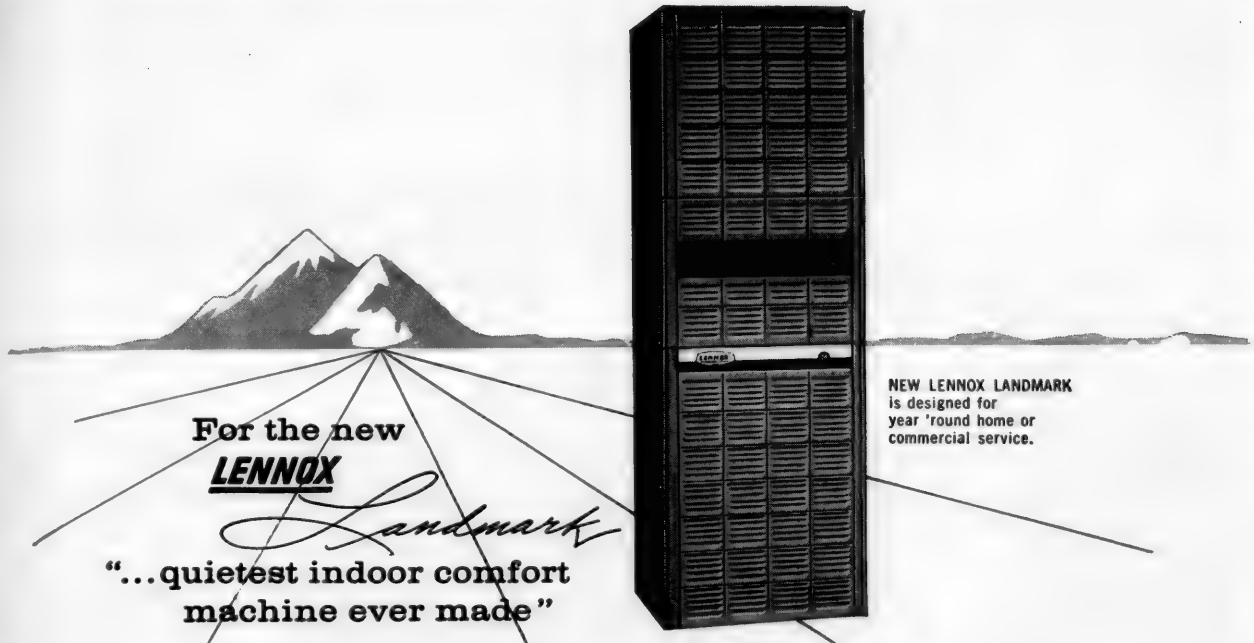

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is designed for
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machine ever made"

FAFNIR Super-Quiet BALL BEARINGS

"...finest bearings obtainable for this service"

In the all-new Lennox Landmark, whisper-quiet service is as much a comfort feature as unique "made-to-measure" heating and cooling provided by interchangeable components — a Lennox innovation.

Uncompromising emphasis on noiseless operation in the development of the versatile Landmark is well borne out by specification of Fafnir Super-Quiet Ball Bearings for the blower shaft mountings.

Balls and races of these Fafnir bearings are specially finished for soundless service. Virtually wear-free bearing steel, lifetime factory lubrication, and positive Plya-Seal protection against dirt, moisture, and loss of lubricant assure quiet, maintenance-free bearing performance through all seasons, year after year.

Take advantage of the job-designed features Fafnir builds into bearings and bearing units for heating and cooling equipment. You'll find a complete selection of types and sizes. Write for new bulletin to The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR SUPER-QUIET BALL BEARINGS on the blower shaft assure silent, power-saving, maintenance-free bearing performance. They are permanently prelubricated and sealed. Specially-developed current-conducting rubber is used when bearings are supplied with grommets, or in rubber cartridges or pressed steel pillow blocks.

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BALL BEARINGS
MOST COMPLETE LINE IN AMERICA

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SKIDMORE PUMPS have set a standard for performance and dependability since 1921

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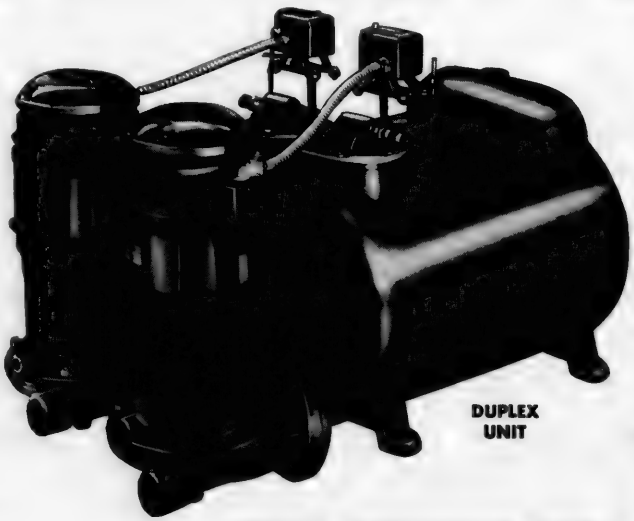
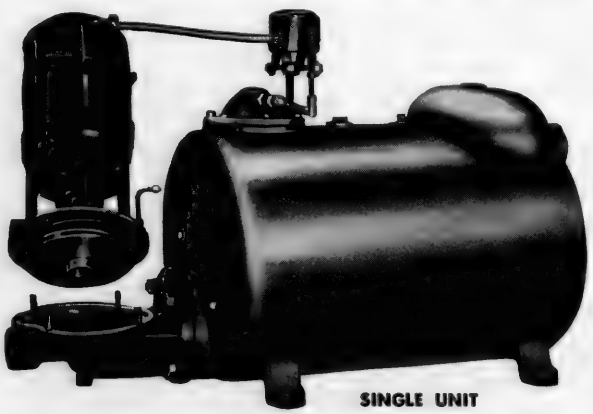
"LOW RETURN"

"EASILY ACCESSIBLE"



DUPLEX UNIT

"VC" CONDENSATION PUMP AND RECEIVER



SINGLE UNIT

ACCESSIBLE FOR INSPECTION

The entire motor and pump unit may be removed for inspection or repair without disturbing piping or pipe connections. Vertical motor construction assures perfect balance and absence of vibration.

Proven Best—

BY PERFORMANCE TEST!

Dependable under all types of conditions and continual service — year after year. The Skidmore "VC" Condensate Pump will handle hot condensate to the boiler or other points from all types of steam heating or process equipment. The unit operates at a wide range of pressures. Receiver has low inlet connection. Motor is elevated and float switch mechanism is mounted on top of receiver to avoid damage from seepage or flood water.

Specify a SKIDMORE PUMP on that next job . . . there's one for every installation.

SKIDMORE PUMPS

SKIDMORE CORPORATION
ST. JOSEPH, MICHIGAN

you can

HEAT & COOL SIMULTANEOUSLY

with these

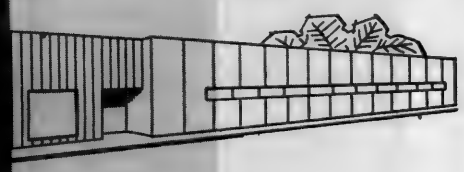
Outside weather conditions, or inside requirements may make it necessary to heat some sections of a building at the same time that other sections require cooling. Where these conditions exist, the McQuay "MC" MULTI-ZONE air conditioning unit will furnish balanced comfort *simultaneously* to different determined areas with either filtered, *cooled* and dehumidified air, or filtered, *heated* and humidified air . . . or a mixture of these in any desired proportions . . . at your command.

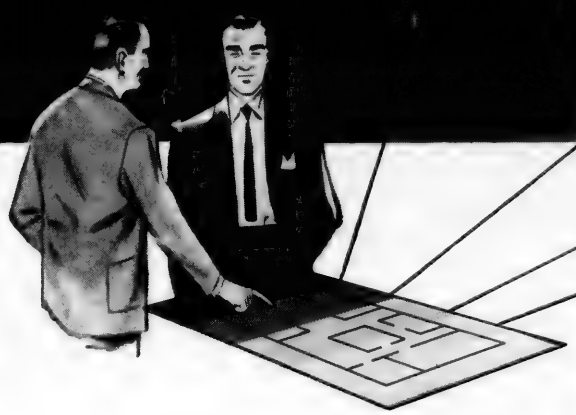
If *you* have this problem, contact the nearest McQuay representative for consultation, complete engineering data and costs . . . When it's McQuay, you can be sure that engineering research and know-how have produced the finest, most efficient and dependable equipment available . . . and, only McQuay makes the famous Ripple-Fin coils. McQuay, Inc., 1619 Broadway St. N.E., Minneapolis 13, Minn. Representatives in all principal cities.

McQuay

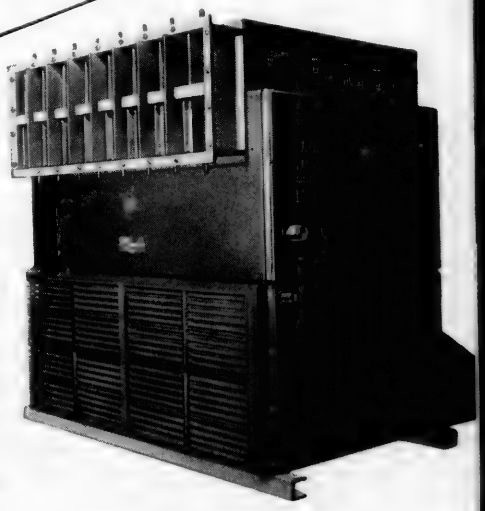
I-ZONE

DITIONERS



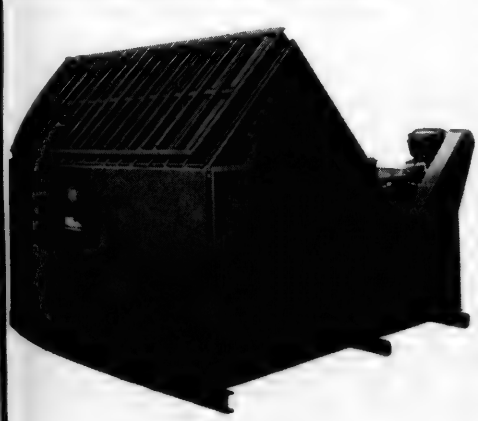


Means Quality



McQuay VERTICAL Multi-Zone unit

McQuay HORIZONTAL Multi-Zone unit



The McQuay "MC" Multi-Zone air conditioning units are available in 8 sizes from 1370 c.f.m. to 21,000 c.f.m. Each unit has a standard number of zones available from 6 on the smallest to 22 on the largest. All zones are interconnected by a single external connecting rod. A full line of accessories is available . . . preheat steam coils, filter sections, mixing boxes, humidifiers.

McQuay INC.

AIR CONDITIONING
HEATING • REFRIGERATION

Know-how makes the

IN HEATER APPLICATION

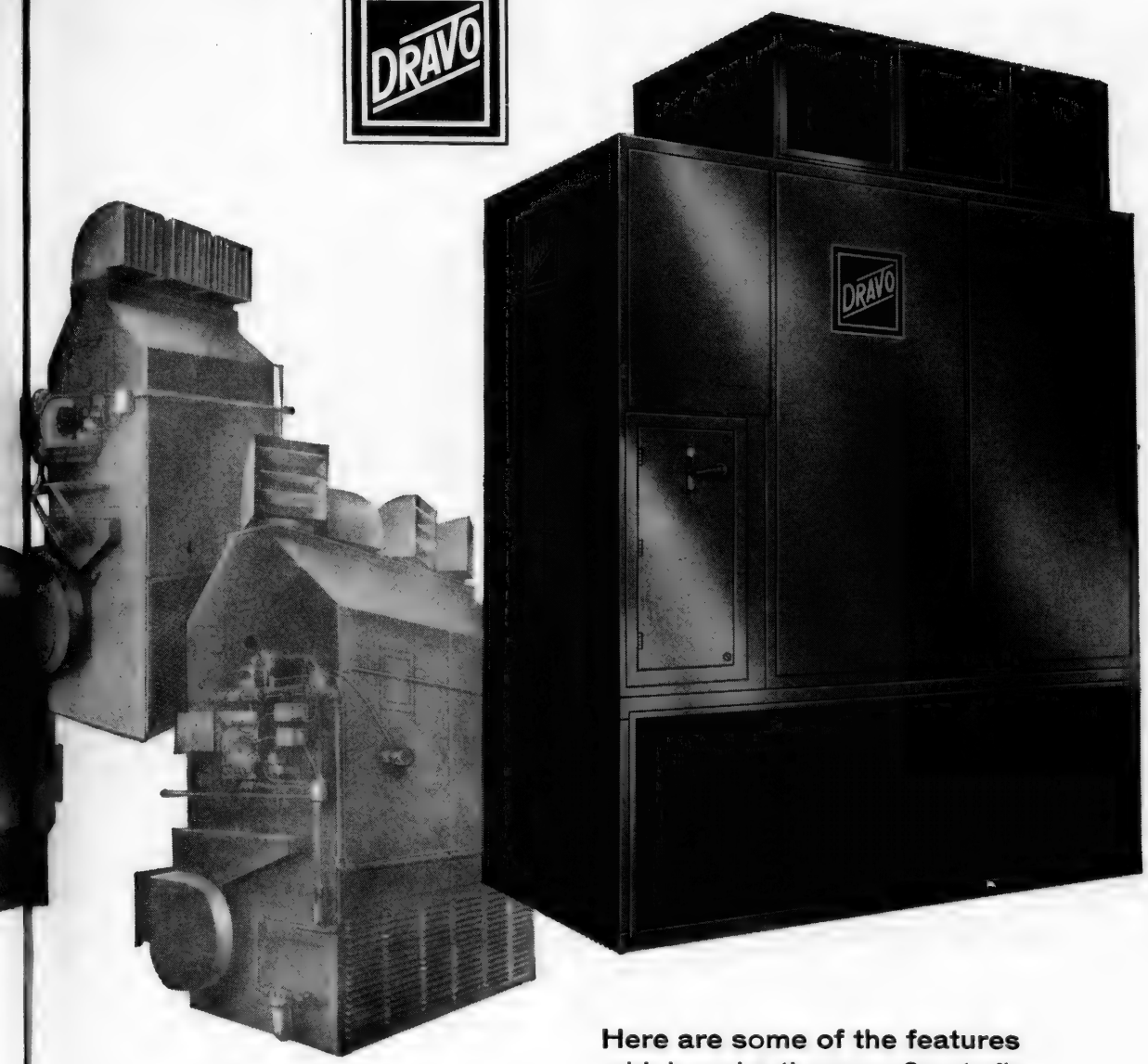
The new Dravo *Counterflo* has performance built in . . . the kind of performance possible only in a heater in which every part has been designed and built to function as an integrated unit. But it is the skill with which this performance is applied to the solution of a specific heating problem that makes it completely effective.

This is the important "extra" that every Dravo Heater customer gets. *Every* Dravo technical representative *is a qualified heating engineer* skilled at solving all kinds of heating problems in all types of industrial and commercial buildings.

Every man is competent to make a complete heating survey of your installation, working in cooperation with your engineering departments or consultant.

Every man is backed by the home office staff, who can bring both laboratory facilities and the total experience of over 10,000 installations to bear on unusual problems.

Get the benefit of this Dravo "extra" when *you* have a heating problem.



difference

IN HEATER DESIGN

The new Dravo *Counterflo* heater, developed by an exhaustive research program, represents an important advance in warm air space heating. Its "unitized" design, making each part integrate smoothly with the functioning of the rest, and the fact that each part was designed specifically for its function, makes the new *Counterflo* unique.

DRAVO
CORPORATION

Here are some of the features which make the new *Counterflo* heater your best heating buy:

NEW PYROJET BURNER—exclusively Dravo—first burner developed specifically for direct-fired space heaters. Burns low cost oils efficiently. Switches from gas to light oil automatically.

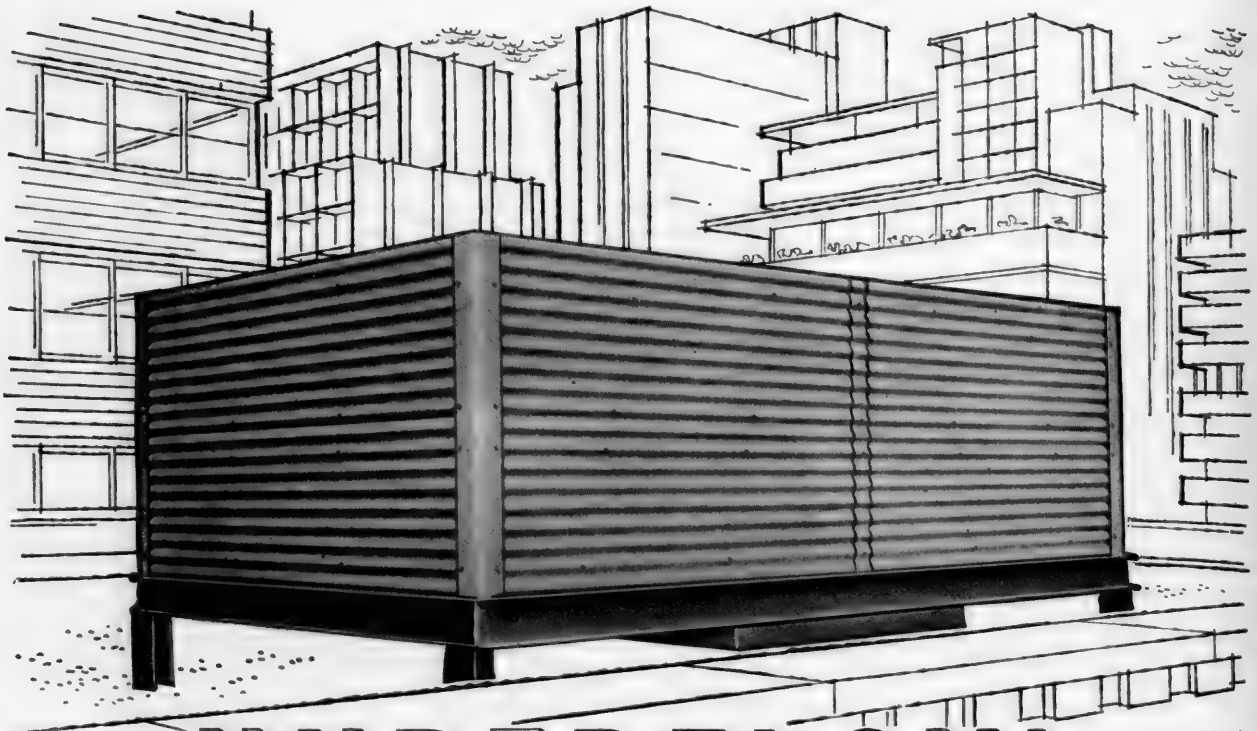
NEW INDUCED DRAFT FIRING—automatically controls fuel/combustion air ratio, high negative pressure in combustion chamber adds extra safety; extra efficiency because of complete control of combustion air.

NEW AIRFOIL COMBUSTION CHAMBER—stainless steel, ribbed for extra strength and channeling of airflow—guaranteed for 10 years. Longest possible flame travel for complete combustion within primary heat transfer area.

NEW LOW-SPEED FANS—forwardly curved, low-speed, double inlet fans with high efficiency reduce horsepower requirements in the new Counterflo drastically, operating costs are lower.

NEW DISCHARGE PLENUM—distributes heated air at high velocity without annoying drafts. Adds new flexibility to warm air distribution patterns.

Bulletin 564 describes the many new features of the new Dravo Counterflo heater. Write or phone for your copy today. Address Dravo Corporation, Dravo Building, Pittsburgh 22, Pennsylvania.



UNDERFLOW®

AQUATOWER

New COMPLETELY ENCLOSED cooling tower complements modern architecture

"I've got a secret," says this newest low-silhouette cooling tower. The UNDERFLOW, in reality, has many secrets, for it is the only tower that is designed to conceal fan, mechanical equipment and air intake area. Even the piping is out of view. The UNDERFLOW is completely encased with asbestos cement board on all sides and most of the top; in appearance it is an integral part of the structure it serves—no need for expensive masonry enclosure.

Its very principle of operation is an innovation in cooling towers. The fan is located beneath the tower and forces air upward into a plenum chamber from which it is diverted horizontally into dual cooling chambers, then discharged vertically at two sides of the tower. This method of cooling permits use of gravity distribution of water, cross-flow air-water contact, close-packed fill for efficient performance, and it produces an inherent sound baffling effect.

This newest intermediate capacity tower offers several important economies. Its steel basin incorporates the primary tower grillage members. Piping and wiring requirements are minimized and simplified since the tower has its own internal distribution system and because the fan, gear drive and motor are mounted below the tower. All connections are made beneath the tower. This location of mechanical equipment eliminates much of the time required for normal inspection and maintenance—the ladder is no longer a standard service accessory.

TO GET THE INFORMATION THE TOWER ITSELF CONCEALS, CONTACT THE MARLEY SALES ENGINEER IN YOUR CITY, OR WRITE FOR BULLETIN UA-58.

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The Marley Company Kansas City, Missouri

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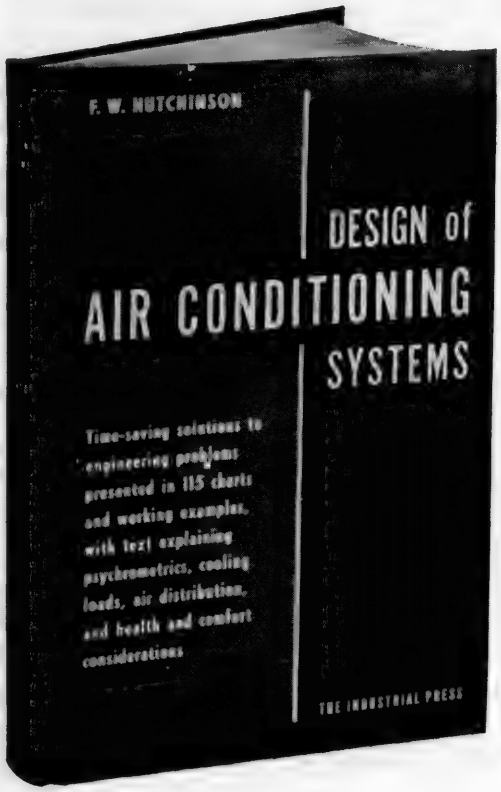
NOW YOU CAN SOLVE PROBLEMS OF AIR CONDITIONING SYSTEM DESIGN—QUICKLY!


F. W. HUTCHINSON
DESIGN of
AIR CONDITIONING
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Time-saving solutions to engineering problems presented in 115 charts and working examples, with text explaining psychrometrics, cooling loads, air distribution, and health and comfort considerations
THE INDUSTRIAL PRESS

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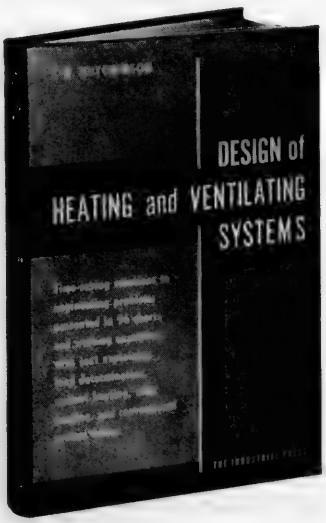
Also by F. W. Hutchinson — DESIGN OF HEATING AND VENTILATING SYSTEMS



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Special Feature of A New Book by F. W. Hutchinson, Author of *Design of Heating and Ventilating Systems*

If you design air conditioning systems, naturally you want fast and accurate solutions to your problems. DESIGN OF AIR CONDITIONING SYSTEMS provides 115 full-page working charts that help you determine: cooling load, duct design, psychrometrics, solar energy, comfort conditioning, panel cooling and other phases of air conditioning design . . . DIRECTLY. In many cases use of the graphs will entirely eliminate calculation, while in others the graphs serve to minimize the arithmetical work needed in solving the equations.

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The author is Professor of Mechanical Engineering at the University of California, and is co-author of a number of books on Panel Heating, Refrigeration and Air Conditioning. His knowledge of system design is well grounded on practical experience as well as theory, as he acts as consultant for many industrial firms.

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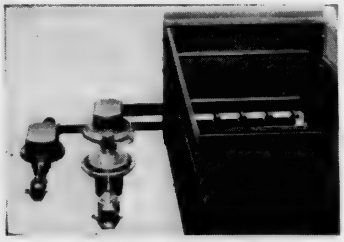
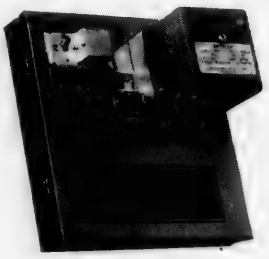


Dual Fuel Manifold and Base

Dual Fuel Control

DUAL FUEL MANIFOLD—optional

This optional feature permits the "J" Boiler to operate on natural gas during normal load periods and change over to LP Gas for low temperature peak loads. Both gases are properly burned within the same combustion zone.



PRE-WIRED ELECTRONIC CONTROL PANEL—optional

The Weil-McLain Model "CP" is a complete gas boiler control system built into a compact panel, factory-assembled and tested. The panel reduces electrical work to a minimum—assures lower installation cost as well as correct operation of the boiler and its electronic safeguard controls.

*Hydronics—the science of heating and cooling with water.

To schools, apartments, commercial and industrial buildings, the Weil-McLain Type "J" Gas Boiler offers dependable hydronic* heating at low operating cost. It is designed in every detail to burn fuel efficiently and to absorb a maximum amount of heat.

Cast iron construction assures long life, with minimum repairs. The "J" Boiler is easy to maintain at top efficiency... simply pulling out the clean-out plates makes the spaces between the sections accessible for cleaning.

The compact design of this boiler permits installation in a small boiler room—saves in construction cost. It's faster to erect because short draw rods simplify installation—assure a strain-free assembly.

The Weil-McLain Type "J" Boiler, in capacities from 625,000 to 5,000,000 A.G.A. input BTU/hr., burns all gases automatically and safely.

Send for engineering data

WEIL-McLAIN

TYPE J GAS-FIRED BOILER

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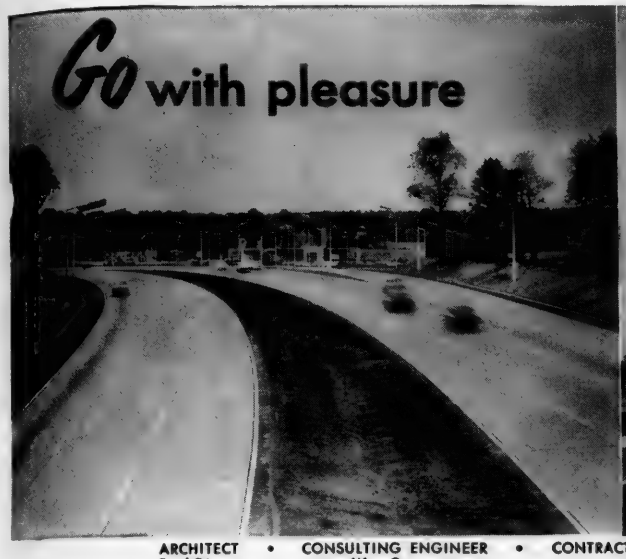
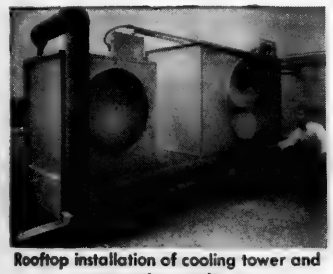
On the new *Connecticut Turnpike...*



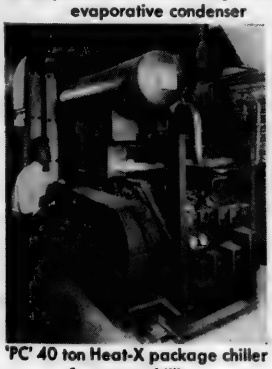
ARCHITECT *Fred Dixon* • CONSULTING ENGINEER *Wm. Carson* • CONTRACTORS FOR HEATING, AIR CONDITIONING & REFRIGERATION *Bay State York, Fred Raff Co., Becker and Goldstein*

Comfort made possible by COMPACT DUNHAM-BUSH EQUIPMENT

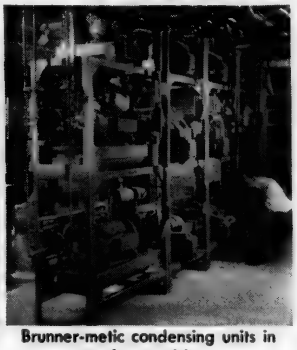


Rooftop installation of cooling tower and evaporative condenser

'Low temp 'ED' electric defrost unit in walk-in cooler



'PC' 40 ton Heat-X package chiller for water chilling



Brunner-metic condensing units in rack assemblies

The matchless combination of engineered compact design and high performance efficiency—that's why Dunham-Bush was selected to serve the eight Savarin restaurants on the new Connecticut Thruway.

The single major problem at each of these eight locations was how to get maximum floor space to accommodate the many travelers, and yet have the kind of equipment necessary to insure complete customer comfort. A solution was sought . . . Dunham-Bush was selected.

Units of the following types are installed at each of the new eating places . . . for complete atmospheric comfort and proper food and drink conditioning: Packaged Water Chillers, Unit Coolers, Evaporative Condensers—all with patented Inner-Fin construction that permits compactness of design previously impossible; Air Handling units, Oil Separator Mufflers, and Rack Assembled Condensing units (for extra space-saving convenience).

Depend on Dunham-Bush, the single, compact organization that has the product depth, diversity, and experience to satisfy every demand for heating, air conditioning and refrigeration equipment.

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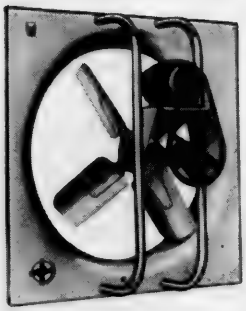

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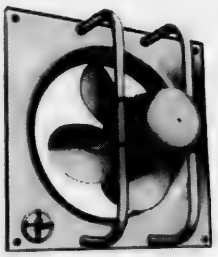
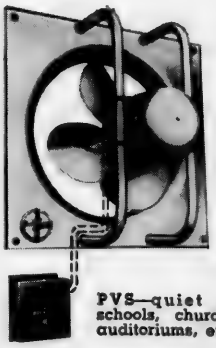
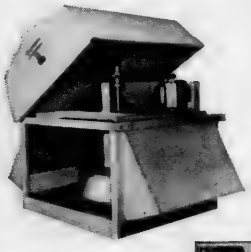


HS—for industrial use, farm buildings, laundries, etc.



PVS—quiet for schools, churches, auditoriums, etc.



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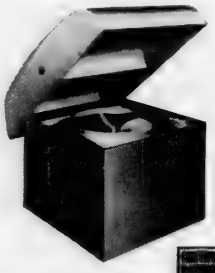

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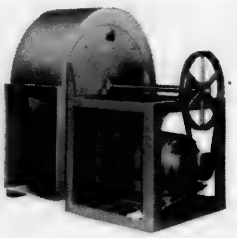

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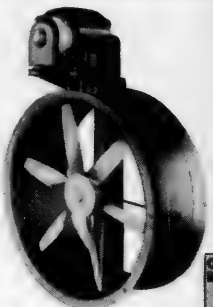

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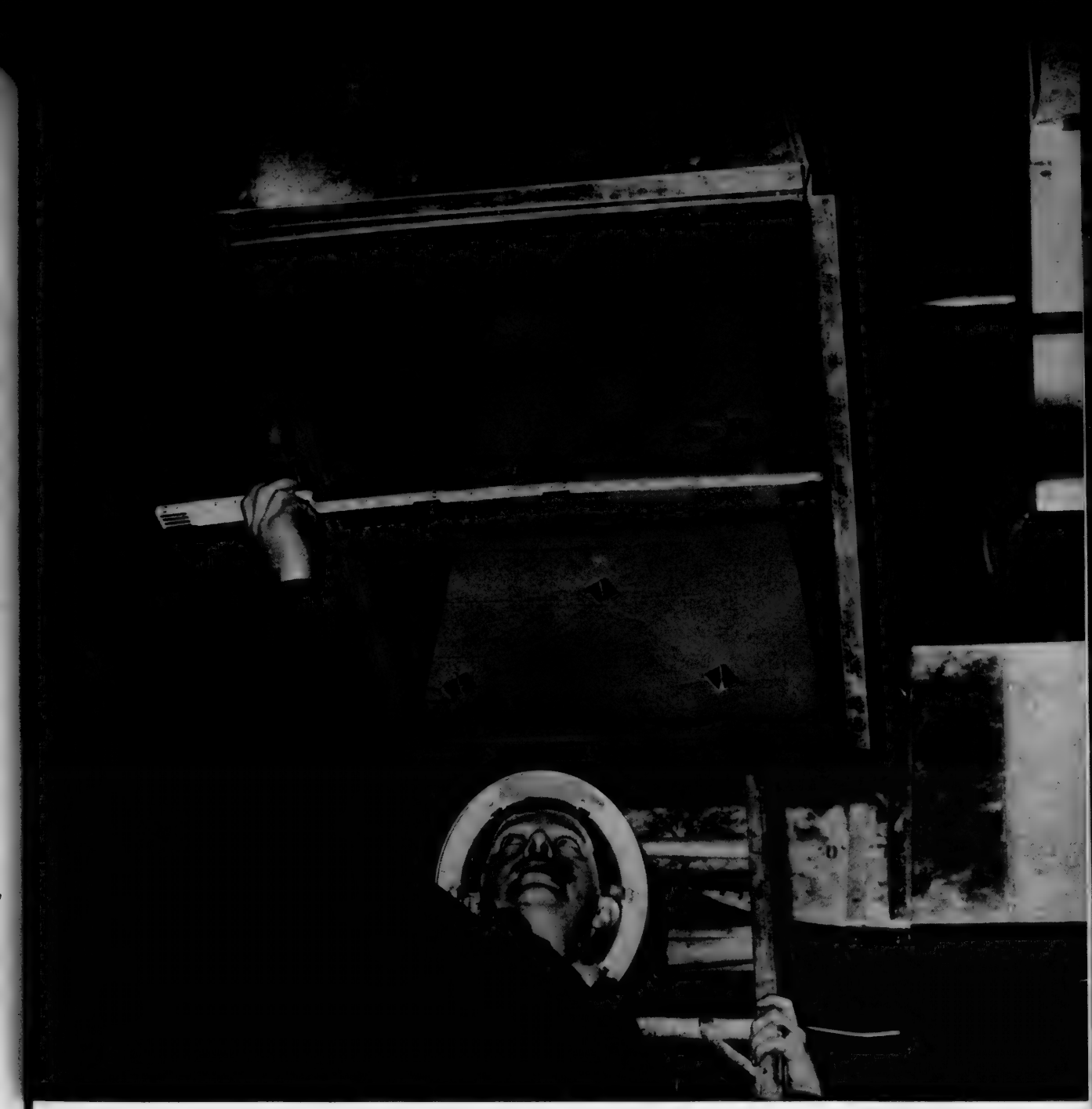

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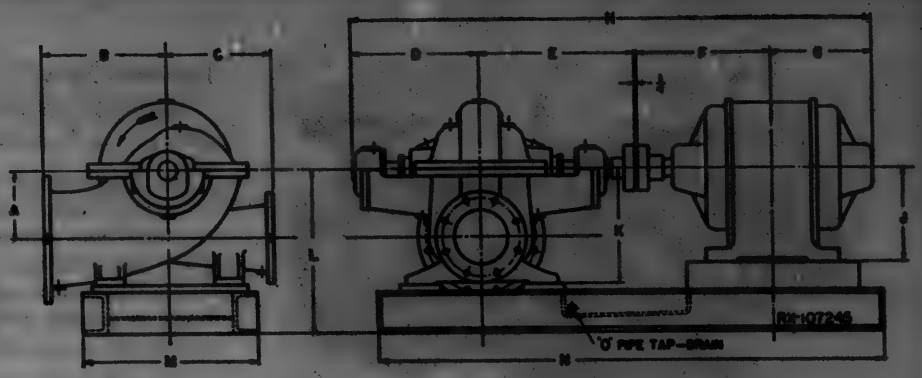

Fig. 1. Typical elevation drawing from a bulletin covering a line of axially split case double suction pumps.

Installation of Centrifugal Pumps

IGOR J. KARASSIK and ROY CARTER
Harrison Division, Worthington Corp.

Two groups of articles on centrifugal pumps, prepared by these authors were published in ACH&V. The first group (June, 1954 to June, 1955) dealt with both structural details and construction of modern centrifugal pumps. The second group (February, 1956 to June, 1956) covered centrifugal pump application. There remains an important phase of the overall subject of centrifugal pumps which will be covered by a new series that starts with this article. It will deal with the installation, operation and maintenance of this equipment; diagnosis of the various difficulties which may beset a pump installation; and recommended cures for these difficulties. This series was planned to provide the plant designing engineer and the operating personnel with information which will help them secure the most reliable service, the least expensive maintenance, and the longest life possible from the centrifugal pumps installed in their plants. This is Part I of a two-part article which is the first of this new series.

INFORMATION contained in this and in the following articles of this series is necessarily general in character and should be supplemented by specific instructions prepared by the manufacture for the particular type of centrifugal pump that the reader may have in mind. Manufacturers generally pack one or more sets of instruction booklets in the box of fittings which accompany their pump. It is of utmost importance that these booklets be placed in the hands of the personnel directly charged with the installation and operation of the pumping equipment, because satisfactory service can only be realized upon strict adherence to these instructions.

Ordering Equipment

It will be assumed that the selection of equipment to be ordered will have been made after the several manufacturers whose equipment is to be considered, have been given full information as to the comtemplated service conditions and they have submitted a complete description of the equipment to be furnished to meet these conditions.

It is important to remember that shipment promises received from pump manufacturers date from the receipt of complete manufacturing information. Therefore, to avoid delays in the preparation of drawings and in the issuance of specifications to the shop for manufacturing, it is necessary that the order entered by the purchaser contain all required information. In addition to the complete conditions of service for the pump as well as the driver, the order should specify the desired direction of rotation, a statement as to whether manufacturing should proceed without awaiting approval of elevation drawings, and other pertinent information. For instance, if the pump is to be driven by a steam turbine equipped with an excess pressure regulator, and if the turbine is to be ordered by the pump manufacturer, the order should specify the location of the pilot lines from the regulator and the value of the excess pressure to be maintained.

Elevation Drawing

If the order for the pump requires the pump manufacturer to furnish the driver, he will order it and obtain a certified elevation drawing from the driver manufacturer before proceeding with the combined elevation drawing. If the driver is ordered separately, it is up to the purchaser to expedite the receipt of the driver print neces-

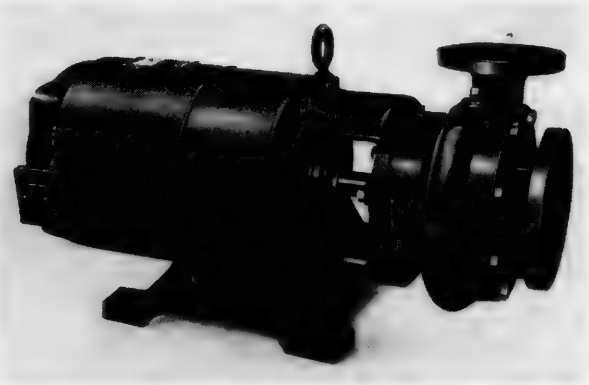

Fig. 2. Close-coupled standard end-suction pumps are generally available in one direction of rotation only.

sary for the preparation of the combined drawing. The proposal submitted by the manufacturer usually includes a bulletin describing the construction features of the equipment as well as an outline drawing of the pump in question, as shown in Fig. 1. The letters of Fig. 1 refer to a table of dimensions for the various size units. While the dimensions given on that drawing are not to be used for final construction purposes, they are sufficiently detailed to serve not only to determine the desired direction of rotation but also to prepare a preliminary layout of the installation.

Direction of Rotation

Since drivers can generally be obtained with either direction of rotation, the choice of rotation is mainly directed towards locating the suction and discharge openings of the pump in proper relation to the proposed piping. Manufacturers of standardized lines of single stage end suction pumps generally limit their designs to a single direction of rotation—whether these pumps are closed-coupled mounted on a motor, as in Fig. 2, or driven by a separate driver. This decision reduces the cost of pattern development and increases the effectiveness of stock inventory without complicating the user's problems, since it does not materially affect nozzle location.

In addition to the general dimensions of the equipment and the location of the baseplate foundation bolts, an outline elevation drawing may show a great number of details such as the location and size of all auxiliary cooling or lubricating piping and space requirements for dismantling. The complexity of the information which will be contained on an outline drawing reflects the severity of the conditions of service involved and, therefore, the complexity of construction of the pump itself.

The construction of equipment for small or medium size pumps intended for general service is generally standard in nature, and unless some special features have been discussed with the pump manufacturer prior to the placement of the order, it is practical to release the pump for manufacturing without formal approval.

Frequently, the construction of the pump itself may be of a standard nature, but approval may be required for the general arrangement, including the baseplate construction. In such an event, the order should authorize the manufacturer to proceed with construction of the pump, limiting the approval prior to manufacturing the baseplate.

Instruction Books

The basic purposes of an instruction book furnished with a centrifugal pump are the following:

1. To assist the user in properly installing the new equipment, so that a maximum of service may be obtained with a minimum of wear and expense.
2. To assist the user in properly adjusting and operating the equipment.
3. To assist the user in the maintenance and repair of the equipment when such repair becomes necessary.

In other words, the instruction books are intended to help the customer's personnel to keep the machinery in an efficient and reliable condition at all times. It is necessary, therefore, that instruction books be available to all the personnel who are intimately involved in this task. They should first be available to the construction personnel responsible for the installation of the equipment. They should be available to operators who use the equipment and make periodic checks or tests. Maintenance men who repair and service the equipment should certainly have access to the instruction books. Finally, engineers who determine the proper use of the apparatus will need to refer to these books. In the event the instruction books incorporate a part list and instructions on the method to be followed in ordering repair parts, a copy should be available to the Purchasing Department or to the one responsible for ordering repair parts.

The exact number of instruction books necessary will therefore depend upon the subdivision of these various tasks among the user's personnel. It is wise to determine at the time the order is placed, how many instruction books will be required.

Preparation for Shipment

After a pump has been assembled in the manufacturer's shop and has been tested, the general procedure in its preparation for shipment is practically identical with all manufacturers. All flanges and exposed finished metal parts are cleaned of foreign matter and treated with an anti-corrosion compound such as grease, vaseline or heavy oil. For protection during shipment and erection, all pipe flanges, pipe openings and nozzles are guarded by so-called service flanges made of wood or by screwed-in metal plugs to prevent the entrance of dirt,

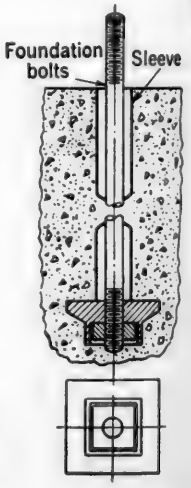

Fig. 3. A pipe sleeve should be provided around each foundation bolt, installed as illustrated.

dust, moisture or foreign matter. All small piping is cleaned and if such piping may be injured during shipment, protective guards are installed.

Driver Mounting

In the majority of cases, the driver is delivered to the pump manufacturer's shop where it is assembled and aligned with the pump on a common baseplate. The baseplate is drilled for driver mounting on receipt of the latter, but the final dowelling is left to be carried out in the field, after final alignment. When size and weight permits, the unit is shipped in the assembled state, that is pump and driver on the baseplate. Once in a while, however, drivers are shipped directly to be mounted in the field. This is especially true of large drivers. In such a case, it is preferable not to drill the baseplate at the pump shop but to do so on arrival at the job site.

Care of Equipment in the Field Prior to Use

Immediately on receipt of the shipment, the equipment should be inspected and checked against the shipping manifest. Any damage or shortage should be reported to the transportation company's local agent.

The pumping equipment may be received on the site some time before it can be used. In such a case, it should be immediately stored in a dry location. The service flanges placed on the suction and discharge nozzles at the factory before shipment should remain attached to the pumps. Care should also be exercised in protecting the bearings and couplings against sand, grit or other foreign matter. Finally, in order to prevent rusting in or binding of the pump rotor, the latter should be turned over by hand at frequent intervals. Once in a while, a rotor will become slightly bound in storage. In order to free it, the thrust bearing should be removed or dismantled and oil throwers, guards or other parts which may restrict end movement should be loosened. Moving the rotor a few times will free it at the wearing rings or wherever the rotating element has become bound at the internal clearances.

Pump Storage

More thorough precautions are required if a pump is scheduled to be stored for an extended period of time. In order to avoid rusting of internal parts, the pump should be carefully dried internally with hot air or by means of a vacuum producing device. Once free of moisture, the pump should be filled with some protective fluid such as light oil, kerosene or anti-freeze. All accessible parts such as bearings and couplings should be dismantled, dried and coated with vaseline or acid-free heavy oil, after which they should be properly tagged and stored. It is recommended, in order to avoid metal to metal contact of these parts in storage, that they should be wrapped or boxed.

If rust preventative has been used on stored parts, they should be thoroughly cleaned prior to final installation. Extreme care must be taken to assure that all traces of the protective coating are removed and the bearings are re-lubricated.

General Rules as to Pump Location

1. When pumps are placed indoors, studies should be made of the immediate surroundings which will affect accessibility. Pumps in poorly lighted and cramped locations or where dirt and moisture accumulate, are improperly placed for dismantling and repair. They will be neglected and both pump and driver may become damaged. Machines of this type should be placed in light, dry and clean locations.
2. When pumping equipment must be used at levels where flooding is possible, two courses of action are possible: (a) A vertical wet pit type pump may be used, or (b) adequate provision, using auxiliary wet pit drainage pumps, must be made as an insurance against damage to the main equipment.
3. If a motor driven unit must be operated in a damp, moist or dusty location, this condition should be carefully studied by the selection of the proper type motor. Pumps and their drivers, when installed in the open, are especially constructed to withstand exposure to weather and are usually readily available for overhaul.
4. In normal installations, pumps should be located as close as practicable to the source of liquid supply. When it can be conveniently done, the pump centerline should be placed below the level of the liquid in the suction reservoir. In all cases, one should be guided very strictly by the manufacturer's recommendations insofar as suction conditions are concerned.
5. For most types of pumping units, more satisfactory service is obtained when rigid foundations are provided.
6. Care must be exercised to provide sufficient room for dismantling the pump. This means that sufficient headroom must be allowed for horizontal pumps. The casing of this type is split axially so that the upper half of the casing may be lifted free of the rotor. Certain types of high pressure pumps are radially split and their rotor is removed longitudinally. Space must be provided in such cases so that the rotor can be pulled out without canting it. For large pumps, with heavy casings and rotors, a travelling crane or facilities for attaching a hoist should be provided over the pump location.

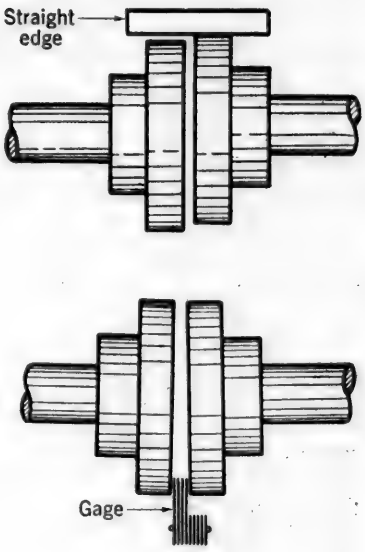

Fig. 4. Use of feeler type gages in aligning pump couplings.

Foundations

The foundations may consist of any structure suffi-

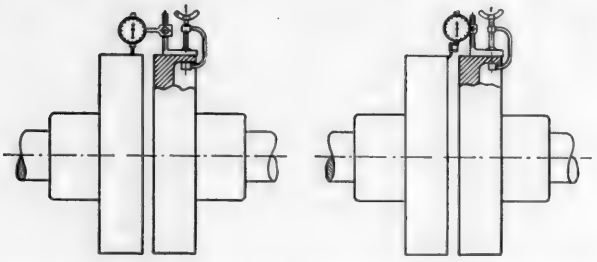

Fig. 5. A dial indicator can be used to line up couplings.

ciently heavy to afford permanent rigid support to the full area of the baseplate and to absorb any normal amount of strains or shocks that may be encountered in service.

Concrete foundations built up from solid ground are the most satisfactory. In building the foundation, allowance should be made between the rough surface of the concrete and the underside of the baseplate for grouting. While most pumping units are mounted on baseplates, very large equipment may be intended to be mounted directly on the foundations. In such a case, soleplates should be provided under the pump and driver feet. This permits correcting the alignment by using shims and makes it possible to remove and replace the unit without difficulty, should the occasion arise.

The space required by the pumping unit and the location of the foundation bolts are determined from the certified drawings supplied by the manufacturer. The foundation bolts, Fig. 3, of the specified size, should be surrounded by a pipe sleeve, three or four diameters larger than the bolt. After the concrete foundations are poured, the pipe is held solidly in place while the bolt may be moved to conform to the corresponding hole in the baseplate.

When a unit is mounted on steel work or other structure, it should be placed directly over or near as possible to the main members, beams and walls and be so supported that the baseplate cannot be distorted and alignment disturbed by any yielding or springing of the structure or of the baseplate.

The mounting of a centrifugal pump and its driver has a great deal of influence on the transmission of vibration and noise. This is a complex subject, however, and one in which a great deal of knowledge is currently being accumulated through experimental verification. It is therefore, impractical to treat this subject here in detail, save to mention that the pump manufacture should be consulted if the problem of noise or vibration is extremely important—as in the case of general service pumps in buildings or of centrifugal pumps used in air conditioning systems. The subject of noise will be treated separately, near the end of this series of articles.

Alignment

When a unit consisting of pump, base, coupling and driver is assembled at the factory, the baseplate is placed on a flat, even surface, the pump and driver mounted thereon, and the coupling halves accurately aligned. Shims are used under the pump and driver mounting surfaces where necessary to provide such alignment. The pump is usually dowelled to the baseplate at the factory. The driver is dowelled after installation on the site because it is not practical to align drivers at the factory and to have this alignment maintained with sufficient accuracy so that the unit can be started up and operated saisfactorily without realignment in the field.

There are several reasons for this requirement. It would be prohibitive in size, weight and cost to provide baseplates of sufficient strength and rigidity, and mounting feet and bolting of sufficient size to permit operation without field realignment. Furthermore, the pump, its driver and the baseplate are subject to such forces in shipment, in mounting the baseplate in place, and in the piping up of the unit, that serious misalignment is introduced. This misalignment is frequently sufficient to cause coupling and bearing failures and, in some cases, even shaft breakage. Thus troubles are almost impossible to avoid unless a final field alignment is made. If the pump handles high temperature liquids, this final alignment should be made with both pump and driver brought up to normal operating temperature.

Pumps are generally shipped mounted and it is usually unnecessary with units of moderate size to remove the pump or driver from its baseplate when leveling. The unit should be placed over the foundation, supported by short strips of steel plate or shim stock close to the foundation bolts, allowing a space from three-quarters to two inches between the bottom of the baseplate and the top of the foundation for grouting. The shim stock should extend fully across the supporting edge of the baseplate. Remove the coupling bolts before proceeding with leveling of unit and alignment of the coupling halves. Wedges are sometimes used instead of flat strips, although this practice is not recommended. If wedges are used, they should be removed from the plate after the grout has become partly set.

Leveling the Baseplate

The projecting edges of pads supporting pump and driver feet, when scraped clean, can be used for leveling the baseplate, with a small spirit level. Where possible, it is preferable to place the level on some exposed part of the pump shaft, sleeve or planed surface of the casing. Adjust the steel supporting strips or shim stock under the baseplate till the pump shaft is level, the flanges of suction and discharge nozzles are vertical or horizontal as required and, at the same time, observe that the pump is at the specified height and location. When the baseplate has been leveled, the nuts on the foundation bolts should be made hand tight.

While proceeding with the leveling of pump and base, at the same time maintain accurate alignment of the unbolted coupling halves between pump and driver shafts. Prior to alignment, the rotors of the pump and of its driver should be revolved by hand to insure that they revolve freely. Place a straight-edge across the top and side of the coupling and, at the same time, check the faces of the coupling halves by means of a tapered thickness gage or feeler gage, Fig. 4, to see that they are parallel. For all checks of alignment, including that for parallelism of coupling faces, it is necessary to keep both shafts pressed hard over to one side when taking the readings.

When the peripheries of the coupling halves are true circles of the same diameter and the faces are flat, exact alignment exists when the distance between the faces is the same at all points and a straight-edge will lie squarely

across the rims at any point. If the faces are not parallel, the thickness gage or feelers will show a variation at different points. If one coupling is higher than the other, the amount may be determined by the straight edge and feeler gages.

It may sometimes occur due to manufacturing tolerances, that coupling halves are not dead true circles and not identically the same diameter. In checking the trueness of either coupling half, revolve it, holding the other coupling half stationary and checking alignment at each quarter turn of the half being rotated. Next revolve and check alignment of the half previously held stationary. A variation within manufacturing limits may be found in either of the half couplings and proper allowance for this must be made when aligning the unit.

Instead of using a straight-edge and feeler gage, a dial indicator bolted to the pump half of the coupling, Fig. 5, may be used to check both radial and axial alignment. With the button of the gage resting on the other coupling periphery, set the dial at zero and chalk mark the coupling half at the point where the button rests. For any check (top, bottom or sides) rotate both shafts by the same amount, i.e. all readings on the dial must be made with its button on the chalk mark. The dial readings will indicate whether the driver has to be raised or lowered or moved to either side. After any movement, it is necessary to check that the coupling faces remain parallel to one another.

Example

If the dial reading at the starting point is set to zero and the diametrically opposite reading at the bottom or sides shows a plus or minus 0.020 inch, the driver has to be raised or lowered by shimming, or moved to one side or the other by half of this reading.

When an extension coupling connects the pump to its driver, a dial indicator, Fig. 6, should be used to check the alignment. The extension piece between the coupling halves should be removed, exposing the coupling hubs. Using the coupling nut on the end of the shaft, clamp a suitable extension arm on bracket sufficiently long to extend across the space between the coupling hubs. The dial test indicator is mounted on this arm and alignment is checked both for concentricity of the hub diameters and parallelism of the hub faces. Changing the arm from one hub to the other provides an additional check.

The clearance between the faces of couplings of the pin and buffer type and the ends of shafts in other types should be set so that they cannot touch, rub or exert a pull on either pump or driver. The amount of this clearance may vary with the size and type of coupling used. The best rule to follow is to allow sufficient clearance for unhampered endwise movement of the shaft of the driving element to the limit of its bearing clearance. On motor driven units, the magnetic center of the motor will determine the running position of the motor half coupling. It is recommended that this position be checked by operating the motor while disconnected. At this time, check also direction of rotation of motor. If current is not available, move motor shaft in both directions as far as bearings will permit, then adjust shaft centrally between these limits, thereafter assembling the unit with the correct gap between coupling halves.

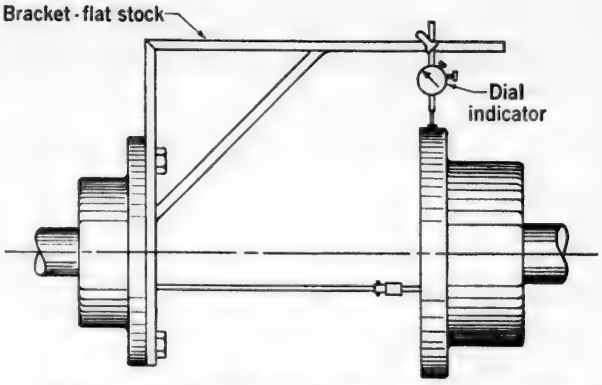

Fig. 6. Use of a dial indicator to line up extension type couplings.

Horizontal sleeve bearing electric motors of large size are not generally equipped with thrust bearings. The rotor is permitted to float and, while it will seek its magnetic center, a force of rather small magnitude can cause it to move off this center.

Sometimes it will do so to such an extent as to cause the shaft collar to contact the bearing. This will generally lead to serious motor bearing difficulties. To avoid this, it has been agreed between pump and motor manufactures, to use a so-called "limited float" coupling between the pump and motor on all large size units, taking advantage of the fact that all pumps are equipped with adequate thrust bearings. In this manner, the motor rotor is kept within a restricted position.

Motor manufacturers mark the two extremes of motor shaft travel and make the total axial clearance between the shaft collars and the bearing shoulders not less than ½ inch. In turn, the pump manufacturers furnish flexible couplings which will limit the end float of the motor rotor to 3/16 inches.

When the pumps are driven by steam turbines, the final alignment should be made with the driver heated to its operating temperature. Where this is not possible at the time of alignment, suitable allowance must be made for the shaft being elevated when the pump expands. In any case the alignment should be checked when the unit is at operating temperature and adjusted as required before placing the pump in service. The application of heat to the steam inlet exhaust piping results in expansion and the installation must be so made that the turbine nozzles are not subjected to piping strains.

When the unit is accurately leveled and aligned, the holding down bolts should be gently and evenly tightened previous to grouting.

Important: Alignment must be rechecked after suction and discharge piping have been bolted to pump, to test the effect of piping strains.

The pump and driver alignment should be occasionally rechecked, because piping strains may develop after a unit has been operating for a time, causing misalignment. This is especially true when the pump handles hot liquids, as there is a likelihood of growth or charge in the shape of the piping. Pipe flanges at the pump should be disconnected after a period of operation to check which way the expansion of the piping is acting and adjustments should be made to compensate for this.

Correct Installation and Service for Refrigeration Systems

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The cause of a number of common trouble that develop in compression type refrigeration systems as the result of improper installation and service are described. Emphasis is placed on ills which develop due to discharge of liquid refrigerant and faulty oil return. Before repairs or adjustments can be made, it is important to know what factors caused faulty operation or equipment damage.

MANY of the ills which develop in compression type refrigeration systems can be minimized, sometimes avoided entirely, by proper installation and service. A common trouble is due to the discharge of refrigerant slugs or liquid in the compressor.

Since all refrigeration compressors are intended to pump gas, they cannot take in liquid refrigerant without the probability of serious damage occurring to the compressor—from valve breakage to complete destruction of the machine. Liquid refrigerant in small drops or in larger quantities which might be called slugs should not be taken into the compressors. Even a mist of liquid refrigerant can lower the viscosity of the cylinder wall lubricant causing excessive wear to the cylinder wall from lack of proper lubrication.

There is no denying that there has been an excessive amount of difficulties with refrigeration installations due to improper installation and operation. It is due in particular to valve breakage, slugs, and carry-over of liquid refrigerant which result in rapid cylinder liner wear and crankshaft breakage.

Oil must be returned to the compressor at the same rate that it leaves with the discharge gas. While this oil may return with suction gas in relatively small drops at an even rate, it must not return in intermediate quantities which are commonly called slugs. The oil may be drained from an oil separator in the discharge line or from any point in the suction circuit connected directly to the compressor. Oil returning directly to the compressor must be at a temperature higher than that corresponding to the crankcase pressure.

Good Operating Conditions

Compressor design and installation should be such that proper operating conditions exist not only during normal full load operation, but also during starting, and during all conditions and changing of load and compressor capacity.

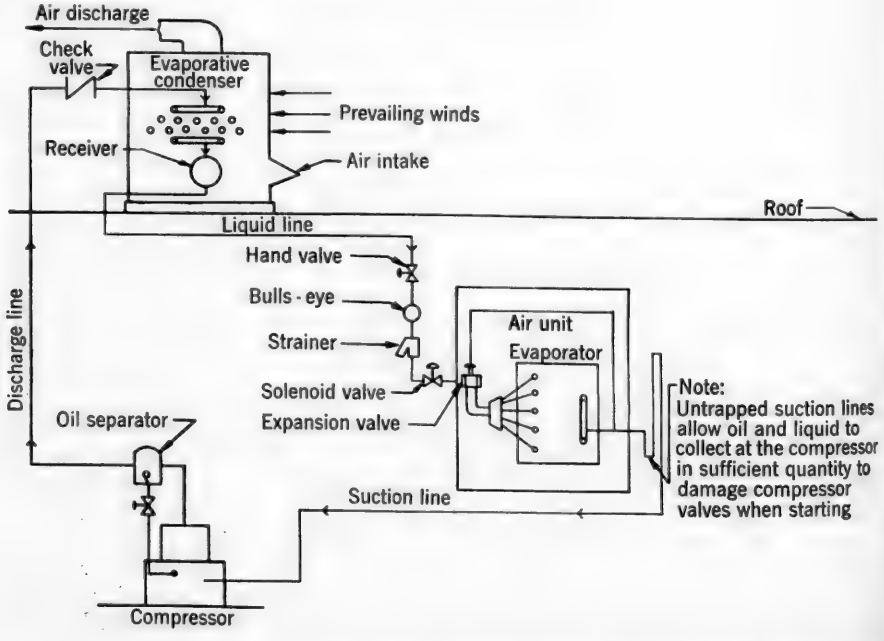

Fig. 1. Typical piping system for a refrigeration system.

If a refrigeration system could start up from a pump down condition, and operate always at the same capacity, and again pump down before the compressor is stopped or its capacity changed; there would be little trouble, unless some control fails or the design is faulty. However, such ideal conditions of operation do not normally exist, and the circuits must be designed so as to function properly at varying loads and with intermediate operation.

A typical piping system is shown in Fig. 1. Attention is directed to some possible problems with means which will assist in controlling slugging. These suggestions are not all inclusive, and the extreme variations in systems and operations make it impossible to cover all details. Obviously, the responsibility for assuming the compressor receives only the proper portion of gas and in the proper form from the system must remain the sole responsibility of those controlling the design, installation and operation of the system. They must also see that all compressor limitations are met under any operating conditions.

Traps to Prevent Slugs

While the operation is steady, the expansion valve will feed liquid at a rate which, near the end of the circuits, leaves just sufficient practical liquid free surface to take care of the superheat the valve is set to maintain. If the compressor stops, the pressure in the evaporator will rise to correspond with the temperatures surrounding it, and this condition is likely to be reached without all of the liquid in the evaporator becoming gas. There may be liquid that will run down to the bottom of the evaporator and possibly directly into the compressor suction line and into the crankcase. In Fig. 1, the suction line is trapped to help prevent this condition from occurring when the compressor is shut down.

Much of the circulation of the refrigerant system is arranged with the main thought of assured oil return. While it is important that oil return at a reasonable constant rate, it is equally important that this circulation, to assure the oil return, does not allow the return of liquid refrigerant to the compressor.

When compressors are operated at higher speeds, proper oil return must be maintained at all times. This becomes a problem when cylinder unloading is used because of the reduced velocities in the suction and discharge lines.

During the operating cycle of some systems, of capacity reduction may be as much as 25% of the full load thus reducing the velocity of the suction gas below the required velocity needed to entrain and return sufficient oil to the compressor at all times.

Oil Return

To provide for oil return during reduced capacity, there has been a common practice of maintaining a particular velocity in suction lines which are vertical or pitched up in order to assure that the oil will be carried along by the suction gas. Obviously, this is not determined alone by velocity. The density of the gas will also influence the tendency to move along the pipe; another influencing factor is actual size of oil drops. Various minimum vertical suction line velocities of such values as 1500 to 2000 fpm have been indicated as necessary, and it seems wise to try to design vertical suction lines at least where there is any sizable rise of more than 2 or 3 feet so the velocities at the minimum loading will be of the order of 1500 fpm or better.

Under conditions of extensive load variation, the attainment of such a velocity at low loads in the vertical lines may require the use of double suction risers. If that is done, it should be realized that the function of a double suction riser is to accumulate liquid or oil in the trap which closes off the larger line.

Two-pipe Riser

Figure 2 illustrates the suggested piping of coils with a trap using a two-pipe riser. When using this type of riser, the two pipes should be selected with a capacity of 1500 fpm or higher for full load conditions; the small pipe sized to maintain 1500 fpm with the compressor operating at its minimum capacity. A tee is installed in the suction line below the outlet of the coil, or coils with a branch outlet in the upper position.

The tee should be the same size as the suction line from the coil. Or, use a tee with a branch opening which is the same size as a selected small pipe riser. On the leaving or straight run side of the tee, make a trap as short as fittings will permit. This can be made with two 45 deg street ells and one 90 deg street ell. Both risers should run high enough to enter the main suction at the top. This will prevent the draining of refrigerant or oil from one riser into another. The main suction line should be pitched toward the compressor, about 1 inch to every 20 ft. This is a good practice to follow on all suction lines.

When the compressor is operating under full load with this two-pipe riser, both pipes will maintain the 1500 fpm velocity. As the compressor unloads, all the suction gas will separate from the oil with a reduced velocity and seal the trap, causing the suction gas to pass up the small pipe at a 1500 fpm gas velocity. When the compressor capacity is increased, the trap seal will be broken and the suction gas passing over the oil in the trap will gradually pick it up and return it to the compressor. For selections of the proper pipe sizes for the systems to maintain proper velocities to return oil to the compressor, refer to data published by compressor manufacturers. Care should be taken when piping the branch suction lines from the coils to the headers to be certain that the lines are properly trapped as shown in Fig. 2.

Suction Trap

It is very important to avoid traps in the suction line whenever possible because oil may accumulate in them at low gas velocities, and be carried back quickly on a sudden increase gas velocity. There are some systems where traps in the suction lines are unavoidable. Under these conditions a suction trap of adequate capacity may be installed between the evaporator and the compressor. It should be as near as possible to the compressor so that the suction line between the trap and the compressor is as short as possible. Since, in most cases, this part of the suction will drop to the compressor, it should be certain that no part of the line or the compressor will have a lower temperature than the suction trap while the system is not operating. Otherwise, any liquid in the trap would evaporate and condense between the trap and the compressor.

The suction trap will accumulate oil continuously, and

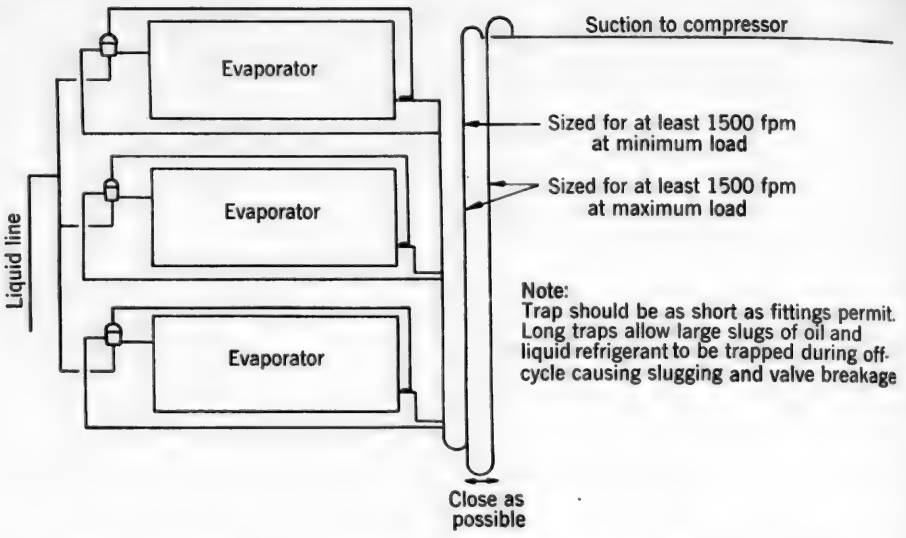
Evaporator
Evaporator
Evaporator
Liquid line
Suction to compressor
Sized for at least 1500 fpm at minimum load
Sized for at least 1500 fpm at maximum load
Note:
Trap should be as short as fittings permit. Long traps allow large slugs of oil and liquid refrigerant to be trapped during off-cycle causing slugging and valve breakage
Close as possible

Fig. 2. Suggested piping of coils using a two-pipe riser and with a trap installed.

liquid refrigerant at varying rates. The refrigerant must be evaporated and returned to the compressor as a gas. The oil, at a temperature several degrees above that corresponding to the saturation at the existing pressure, should be returned directly to the compressor if convenient. If there is an accumulation of refrigerant in the suction trap such that the heat from the ambient does not evaporate rapidly enough, an outside source of heat is required. Heat may be supplied by the warm liquid refrigerant or relatively warm liquid from the sub-cooler, or it may be supplied electrically. Care should be taken in the design of the heating arrangement to assure heating from the low point of the accumulated liquid to permit the gas rising without carrying the liquid up with it. The heater should be in the bottom of the suction trap, or in a vessel below the trap, and connected to it by a vertical line at least 1½-inch diameter. Otherwise, poor operation with possible surging and reduction of column height needed for return of oil may result.

When a standard type of knock-out drum or suction trap is installed in the suction line before the compressor, it is most important that this line continue down to the compressor. If this is not done, it will leave a trap in the suction line which could accumulate slugs of oil or liquid between the suction trap and the compressor where the suction trap could not eliminate it.

Continuous Pump Down

All parts of the compressor, and any part of the suction line between the compressor and any suction trap, must have a temperature higher than the temperature in any other part of the system connected with the suction, and must contain liquid. During shutdown of the system, this may not apply, unless a pump down is used or means provided to heat both the compressor and the suction trap, and also possibly part of the suction line. One means of controlling this is by a continuous pump down during shut down since that assures the pressure in the suction line will not be as high as that corresponding to the temperatures which would exist, and liquid could not exist in any of those points at that low pressure.

If a continuous pump down is used, there should be considerable differential between the cut in and cut out point. The pressure controller used for this should not be the safety control of the high low pressure which is protection for the compressor. Often this is manually reset and does not serve the purpose in any case. In a system using refrigerant 12, a reasonable point to stop the compressor on pump down would be 10 psig; with refrigerant 22, it should be limited to about 20 psig. The point at which the compressor cuts in should be at a pressure which corresponds to a temperature lower than would be expected at any point where it is desired that the refrigerant does not exist as a liquid. For example, if it is certain that no part of the low side will have a temperature lower than 50 deg, the cut in point for refrigerant 12 could be about 40 psig and for refrigerant 22 about 75 or 80 psig.

Use of Time Switch

On installations where this start-up is not frequent enough, a one hour dial time switch can easily be installed to operate with the pressure control on a 3-wire circuit. This timer could have three contacts which would result in starts of 20, 30 and 60 minutes or one which would result in the start every hour if required. This time switch would make the contacts for a few seconds at any predetermined period such as the 20 minutes, 30, or 60 minutes time indicated. If, at the time the contact was made, the pressure had risen to the cut-in point, the compressor would start and continue until the cut-out point was again reached. If the contact is made and the pressure has not risen, there would be no starting of the compressor.

The important thing is that not too much liquid should accumulate, and the start of the frequency should assure that too much cannot accumulate. This pump down arrangement assures that the amount of refrigerant in the oil will be low and there will not be carry over of liquid at the start.

If this continuous pump down is used, the solenoid valve cannot be connected in parallel with the compressor holding coil, because it must open before the pressure can build up so that the compressor will start. It is, however, desirable that the solenoid only open if there is power at the compressor starter, and if all safety controls such as the high low cut out, the thermal overload switch in the starter for the compressor and the oil failure switch

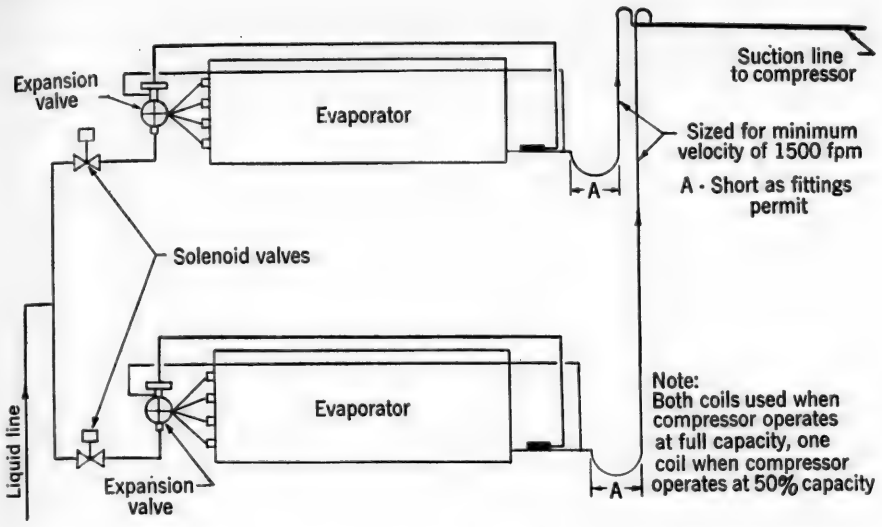

Fig. 3. Piping arrangement for a system using two evaporator coils and two expansion valves.

are closed so that the compressor can start when the pressure rises to the set point.

In designing refrigeration systems, particularly those for usual conditions, one should not overlook the fact that operations will not always be at designed conditions. Temperature must be brought down initially. Pressures or temperatures may rise due to unexpected changes in load or differences in balance between stages.

Valve Selection

In choosing valves for control of flow, the size selection should be such as to obtain the flow at the desired pressure drop. The size of the line in which the valve is to be installed should in no way influence the choice of valve size. In some cases, the valve may be required to have a very high pressure drop during some periods such as start-up, and almost no pressure drop with the lower inlet pressure at other times. To insure satisfactory operation, the valve manufacturer must be given the full data for both extremes. Two or more valves may be required to obtain desired results.

Figure 3 shows schematic piping for a system using two coils and two expansion valves. If we assume that the suction line at the point where the bulb is to be located is horizontal, and the flow into it is such that the liquid would surely go to the bottom if any entered that part of the suction line, the bulb should be located as near the bottom of the pipe as possible, without preventing the straps from making good contact with the bottom. In other words, since the straps are transmitting most of the heat between the bulb and the pipe, they must be in contact with the bottom where liquid would be expected to touch, but the bulb should be as near that point as possible. The point where the screw pulls the ends of the strap together should preferably be opposite the point where the bulb is located. This point where the two ends of the strap separate should not be at the bottom of the pipe or between the bottom of he pipe and the bulb or at the bulb. If this break is on the far side away from the bulb, it will be the most advantageous.

Evaporative Condenser

In recent years evaporative condensers have gained wide acceptance in commercial and industrial refrigeration that are part of air conditioning systems because of restriction placed on the use of water. In some places, sewage facilities are inadequate for water wasted from shell and tube condensers. The condenser is usually located above the compressor as shown in Fig. 1 and this presents installation problems according to the particular installation. The unit should be installed so that prevailing winds will blow toward the air inlet as indicated in Fig. 1. This will aid the fans in drawing air over the condenser coils and through the water sprays. In certain locations where the amount of free air to the unit is limited, air ducts must be installed to bring fresh air to the intake opening of the unit. When a duct is used with a unit, it must be properly sized so that the air circulation does not affect either the fan volume or the condenser capacity.

Correcting High Temperature

When an outside evaporative condenser is used, there are times when the temperature during an idle period may be such that rather high pressures develop in the high pressure side of the system. This can result in liquid boiling in the condenser, and condensing in cooler points, such as the compressor heads or cylinders in an oil separator, if used, or in the discharge line itself. A trap in a discharge line will do nothing to reduce this possibility, because what is being transmitted from the condenser to the compressor is in the form of a gas, and only becomes a liquid again when it condenses at that particular cooler point.

If this situation occurs, a check valve in the discharge line may be of help, as shown in Fig. 1. It must be realized that if any part of the circuit is cooler than another part connected with it and containing liquid, the liquid will evaporate from the warmer section and condense in the cooler. The crankcase of the compressor with its heater maintaining around 110 deg may not condense, while the top of the cylinders of the heads may be 80 to 90 deg and condense from the evaporative condenser at temperature of 110 deg or over. Evaporative condensers on the roof may easily have higher temperatures than 110 deg.

The location and operation of the equipment should be studied before any changes are made to correct trouble jobs.

Important to Find Cause

The majority of compressor failures are not due to a defective compressor or defective parts, but to external reasons, such as improper installation, improper maintenance, failure in the control system or some other external cause. This cause must be corrected. Failure and breakdown don't just happen: There must be a reason. Service men and maintenance personnel must be trained to ask why, until they find the real reason.

One of the prime factors in the reduction and elimination of continued breakdowns is to analyze the cause of the failure and to correct the real reason for the failure rather than to just press a re-set button or replace a broken part.

Replacement of the broken part without properly analyzing the cause of the failure and then correcting the real reason for the failure, quite frequently allows the replaced parts to be damaged in the same manner as the original parts. That is why maintenance and service men should always be trained to ask why. Why did the valve break? Why is the compressor kicking out an overload relay? Why did the hermetic compressor burn out? Why did the compressor slug or lose its oil?

When a sluggish expansion valve loads a compressor with liquid, breaking valves, or burning out bearings, the service man or maintenance man who merely repairs or replaces the parts and pays no attention to the real trouble—which was the expansion valve—is inviting the same damage to the new parts. When the above conditions exist, the system should be checked to determine why the parts have failed.

When the compressor is kicking out on overloads, the service or maintenance man should not install oversized heaters, but should determine why the machine is cutting out: Is the unit getting enough water? Are the water pipes large enough? Are the belts too tight? Are the power lines large enough? Is there a loose connection in the starter? Or is there a defective relay? Is the system overloaded? The service man should use an ampere-volt meter as well as his other tools to determine the actual trouble. The voltage and current in all phases of electrical supply should be checked against the nameplate rating. Readings should be taken at the terminals of both motor and starter.

Without finding the actual cause, the service man has accomplished nothing except to run up excessive repair charges and in most cases hurt the reputation of the manufacturer of the equipment because the customer feels that the equipment is defective. All too often service men will start removing parts, replacing valves and replacing the compressor without properly analyzing the troubles. This runs up service charges, causes call backs on service calls and in general creates customer dissatisfaction with the equipment and the service company. Service men and maintenance personnel should remember to analyze the troubles and not make unnecessary repairs unless sure that the part that is being replaced is actually giving the trouble.

Important to Control Slime and Algae

One of the more complex problems in the maintenance of air conditioning systems is the control of slime and algae, both potential trouble makers.

Dr. Sidney Sussman, chief chemist of Water Service Laboratories, Inc., specialists in water treatment, points out that one of the principal reasons why the control of slime and algae is often more difficult than arresting scale or corrosion is that the former result from the growth of living organisms. Many species of slime-producing bacteria and algae are involved and each responds differently to various methods of treatment. Even within a given species, not all of the bacteria have the same response to a given dosage of any slimicide, even as human beings will respond differently to the same dose of a given medicine. It is for this reason that it is not always possible to clear up completely slime and algae problems merely by including a fixed amount of slimicide among the chemicals that are used for scale and corrosion control.

Before going into additional methods of chemical treatment and maintenance hints useful in combatting slime and algae, Dr. Sussman describes the organisms and the troubles they can cause. Slimes are generally grayish or yellowish accumulations of mucoid material produced by bacteria during their growth processes. Slimes tend to cling to many parts of the air conditioning system where they can interfere with the flow of water through nozzles, cause high head pressures in refrigerant condensers, produce odors in air washers, and increase corrosion in the equipment.

Algae are colored organisms, generally some shade of green, such as the green scum frequently seen on the surface of ponds. They require sunlight for their growth and are found in the head pans of those cooling towers which have perforated head pans for water distribution. They can grow quite rapidly to form a thick mat of green organic material which may clog the holes or nozzles in the head pan and interfere with the operation of the cooling tower to the extent that it will no longer provide sufficient cooling.

The organisms together with other matter are picked up from the atmosphere whenever circulating cooling water is exposed to the air. This happens in such equipment as cooling towers, evaporative condensers and air washers which act as air scrubbers.

Among the materials scrubbed from the air are acidic gases and air-borne dirt. The latter is a widely varying mixture of particles of sand, construction materials, soot, and organic matter. It also includes many bacteria, and the seeds and spores of plants. Included among these are the slime-forming bacteria and the spores of algae.

When indications of slime or algae formation are noted, it is important that the operator of the equipment should notify his water treatment company promptly and that thereafter both cooperate closely in taking steps to overcome this trouble. A two-fold attack is necessary in order to eliminate the slime as quickly as possible and to maintain the system reasonably slime-free. Good housekeeping, including regular maintenance cleanings, plays a major part in such a program.

FAHRENHEIT-CENTIGRADE CONVERSION

The numbers in the center column, in bold face type, refer to the temperature in either Fahrenheit or Centigrade degrees. If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left. If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

Interpolation factors are given for use with that portion of the table in which the center column advances in increments of 10. To illustrate, suppose it is desired to find the Fahrenheit equivalent of 314 deg C. The equivalent of 310 deg C, found in the body of the main table, is seen to be 590 deg F. The Fahrenheit equivalent of a 4-deg C difference is seen to be 7.2, as read in the table of interpolating factors. The answer is the sum or 597.2 deg F.

Interpolation Factors

Deg C		Deg F	Deg C		Deg F
0.56	1	1.8	3.33	6	10.8
1.11	2	3.6	3.89	7	12.6
1.67	3	5.4	4.44	8	14.4
2.22	4	7.2	5.00	9	16.2
2.78	5	9.0	5.56	10	18.0

Above 1000 in the center column, the table increases in increments of 50. To convert 1462 deg C to Fahrenheit, for instance, add to the Fahrenheit equivalent of 1400 deg C ten times the interpolation factor for 6, and the interpolation factor for 2, or 2552 + 108 + 3.6, which equals 2663.6.

For conversions not covered in the table, the following formulas are used:

$$F = 1.8\ C + 32$$
$$C = (F-32) \div 1.8$$

Deg C		Deg F	Deg C		Deg F	Deg C		Deg F	Deg C		Deg F
−273	−459.4	...	−101	−150	−238	− 8.3	17	62.6	9.4	49	120.2
−268	−450	...	− 96	−140	−220	− 7.8	18	64.4	10.0	50	122.0
−262	−440	...	− 90	−130	−202	− 7.2	19	66.2	10.6	51	123.8
−257	−430	...	− 84	−120	−184	− 6.7	20	68.0	11.1	52	125.6
−251	−420	...	− 79	−110	−166	− 6.1	21	69.8	11.7	53	127.4
−246	−410	...	− 73	−100	−148	− 5.6	22	71.6	12.2	54	129.2
−240	−400	...	− 68	− 90	−130	− 5.0	23	73.4	12.8	55	131.0
−234	−390	...	− 62	− 80	−112	− 4.4	24	75.2	13.3	56	132.8
−229	−380	...	− 57	− 70	− 94	− 3.9	25	77.0	13.9	57	134.6
−223	−370	...	− 51	− 60	− 76	− 3.3	26	78.8	14.4	58	136.4
−218	−360	...	−46	−50	−58	− 2.8	27	80.6	15.0	59	138.2
−212	−350	...	−40	−40	−40	− 2.2	28	82.4	15.6	60	140.0
−207	−340	...	−34	−30	−22	− 1.7	29	84.2	16.1	61	141.8
−201	−330	...	−29	−20	− 4	− 1.1	30	86.0	16.7	62	143.6
−196	−320	...	−23	−10	14	− 0.6	31	87.8	17.2	63	145.4
−190	−310	...	−17.8	0	32−	0−	32	89.6	17.8	64	147.2
−184	−300	...	−17.2	1	33.8	0.6	33	91.4	18.3	65	149.0
−179	−290	...	−16.7	2	35.6	1.1	34	93.2	18.9	66	150.8
−173	−280	...	−16.1	3	37.4	1.7	35	95.0	19.4	67	152.6
−169	−273	−459.4	−15.6	4	39.2	2.2	36	96.8	20.0	68	154.4
−168	−270	−454	−15.0	5	41.0	2.7	37	98.6	20.6	69	156.2
−162	−260	−436	−14.4	6	42.8	3.3	38	100.4	21.1	70	158.0
−157	−250	−418	−13.9	7	44.6	3.9	39	102.2	21.7	71	159.8
−151	−240	−400	−13.3	8	46.4	4.4	40	104.0	22.2	72	161.6
−146	−230	−382	−12.8	9	48.2	5.0	41	105.8	22.8	73	163.4
−140	−220	−364	−12.2	10	50.0	5.6	42	107.6	23.3	74	165.2
−134	−210	−346	−11.7	11	51.8	6.1	43	109.4	23.9	75	167.0
−129	−200	−328	−11.1	12	53.6	6.7	44	111.2	24.4	76	168.8
−123	−190	−310	−10.6	13	55.4	7.2	45	113.0	25.0	77	170.6
−118	−180	−292	−10.0	14	57.2	7.8	46	114.8	25.6	78	172.4
−112	−170	−274	− 9.4	15	59.0	8.3	47	116.6	26.1	79	174.2
−107	−160	−256	− 8.9	16	60.8	8.9	48	118.4	26.7	80	176.0

FAHRENHEIT-CENTIGRADE CONVERSION TABLE (CONT'D)

Deg C		Deg F	Deg C		Deg F	Deg C		Deg F	Deg C		Deg F
27.2	81	177.8	58.3	137	278.6	89.4	193	379.4	304.4	580	1076
27.8	82	179.6	58.9	138	280.4	90.0	194	381.2	310.0	590	1094
28.3	83	181.4	59.4	139	282.2	90.6	195	383.0	315.6	600	1112
28.9	84	183.2	60.0	140	284.0	91.1	196	384.8	321.1	610	1130
29.4	85	185.0	60.6	141	285.8	91.7	197	386.6	326.7	620	1148
30.0	86	186.8	61.1	142	287.6	92.2	198	388.4	332.2	630	1166
30.6	87	188.6	61.7	143	289.4	92.8	199	390.2	337.8	640	1184
31.1	88	190.4	62.2	144	291.2	93.3	200	392.0	343.3	650	1202
31.7	89	192.2	62.8	145	293.0	93.9	201	393.8	348.9	660	1220
32.2	90	194.0	63.3	146	294.8	94.4	202	395.6	354.4	670	1238
32.8	91	195.8	63.9	147	296.6	95.0	203	397.4	360.0	680	1256
33.3	92	197.6	64.4	148	298.4	95.6	204	399.2	365.6	690	1274
33.9	93	199.4	65.0	149	300.2	96.1	205	401.0	371.1	700	1292
34.4	94	201.2	65.6	150	302.0	96.7	206	402.8	376.7	710	1310
35.0	95	203.0	66.1	151	303.8	97.2	207	404.6	382.2	720	1328
35.6	96	204.8	66.7	152	305.6	97.8	208	406.4	387.8	730	1346
36.1	97	206.6	67.2	153	307.4	98.3	209	408.2	393.3	740	1364
36.7	98	208.4	67.8	154	309.2	98.9	210	410.0	398.9	750	1382
37.2	99	210.2	68.3	155	311.0	99.4	211	411.8	404.4	760	1400
37.8	100	212.0	68.9	156	312.8	100.0	212	413.6	410.0	770	1418
38.3	101	213.8	69.4	157	314.6	104.4	220	428.0	415.6	780	1436
38.9	102	215.6	70.0	158	316.4	110.0	230	446.0	421.1	790	1454
39.4	103	217.4	70.6	159	318.2	115.6	240	464.0	426.7	800	1472
40.0	104	219.2	71.1	160	320.0	121.1	250	482.0	432.2	810	1490
40.6	105	221.0	71.7	161	321.8	126.7	260	500.0	437.8	820	1508
41.1	106	222.8	72.2	162	323.6	132.2	270	518.0	443.3	830	1526
41.7	107	224.6	72.8	163	325.4	137.8	280	536.0	448.9	840	1544
42.2	108	226.4	73.3	164	327.2	143.3	290	554.0	454.4	850	1562
42.8	109	228.2	73.9	165	329.0	148.9	300	572.0	460.0	860	1580
43.3	110	230.0	74.4	166	330.8	154.4	310	590.0	465.6	870	1598
43.9	111	231.8	75.0	167	332.6	160.0	320	608.0	471.1	880	1616
44.4	112	233.6	75.6	168	334.4	165.6	330	626.0	476.7	890	1634
45.0	113	235.4	76.1	169	336.2	171.1	340	644.0	482.2	900	1652
45.6	114	237.2	76.7	170	338.0	176.7	350	662.0	487.8	910	1670
46.1	115	239.0	77.2	171	339.8	182.2	360	680.0	493.3	920	1688
46.7	116	240.8	77.8	172	341.6	187.8	370	698.0	498.9	930	1706
47.2	117	242.6	78.3	173	343.4	193.3	380	716.0	504.4	940	1724
47.8	118	244.4	78.9	174	345.2	198.9	390	734.0	510.0	950	1742
48.3	119	246.2	79.4	175	347.0	204.4	400	752.0	515.6	960	1760
48.9	120	248.0	80.0	176	348.8	210	410	770.0	521.1	970	1778
49.4	121	249.8	80.6	177	350.6	215.6	420	788	526.7	980	1796
50.0	122	251.6	81.1	178	352.4	221.1	430	806	532.2	990	1814
50.6	123	253.4	81.7	179	354.2	226.7	440	824	537.8	1000	1832
51.1	124	255.2	82.2	180	356.0	232.2	450	842	565.6	1050	1922
51.7	125	257.0	82.8	181	357.8	237.8	460	860	593.3	1100	2012
52.2	126	258.8	83.3	182	359.6	243.3	470	878	621.1	1150	2102
52.8	127	260.6	83.9	183	361.4	248.9	480	896	648.9	1200	2192
53.3	128	262.4	84.4	184	363.2	254.4	490	914	676.7	1250	2282
53.9	129	264.2	85.0	185	365.0	260.0	500	932	704.4	1300	2372
54.4	130	266.0	85.6	186	366.8	265.6	510	950	732.2	1350	2462
55.0	131	267.8	86.1	187	368.6	271.1	520	968	760.0	1400	2552
55.6	132	269.6	86.7	188	370.4	276.7	530	986	787.8	1450	2642
56.1	133	271.4	87.2	189	372.2	282.2	540	1004	815.6	1500	2732
56.7	134	273.2	87.8	190	374.0	287.8	550	1022	1093.9	2000	3632
57.2	135	275.0	88.3	191	375.8	293.3	560	1040	1648.9	3000	5432
57.8	136	276.8	88.9	192	377.6	298.9	570	1058	2760.0	5000	9032

CENTRAL HEATING IN THE USSR

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-Part Two-

Equations for calculation of the performance of concrete heating panels are given, after which the author discusses the installation as part of prefabricated walls in Russian buildings. Experiments with glass tubing embedded in concrete to replace steel are described. This second of a three-part series concludes with a summary of Russian practice in warm-air heating and ventilation of apartment houses.

Theoretical and laboratory research on heating panels placed underneath windows has led to the following conclusions of essential importance for calculating purposes.

The quantity of heat given off by the panels by radiation is greater than that given off by convection; this last, reaching 50% at the nominal temperatures, decreases further as the temperature of the panel surface falls. Thus for example, with a temperature difference of 30C[54F] between panel and room, the relative quantities of heat given off by radiation and convection are respectively as 56% to 44%, and when the temperature difference falls off to 10C[50F], the quantities become respectively 64 and 36%.

Thermal calculations for rooms heated with heating panels set beneath the windows can be made with sufficient accuracy in the same manner as for heating with radiators.

The quantity of heat given off by a heating panel placed in the wall is calculated by the expression

$$Q = Q_f + Q_a \text{ kcal per hr} \qquad (1)$$

(One kilogram calorie = 3.968 Btu.)

where Q_f is the quantity of heat given off by the front portion of the panel, and Q_a is the quantity of heat given off by the rear portion of the panel.

The quantity of heat given off by the front portion is calculated by the expression

$$Q_f = \alpha\,(t_p - t_i)\,lh \text{ kcal per hr} \qquad (2)$$

where α is the coefficient of heat transfer of the front portion of the panel, t_p is the average temperature of the surface of the panel (determined by any known method) in deg C, t_i is the temperature of the inside air in deg C, l is the length of the panel in meters, and h is the height of the panel in meters.

To compute the coefficients of heat transfer, the following expression is used:

$$\alpha = 4.56\,\frac{(T_p/100)^4 - (T_i/100)^4}{T_p - T_i} + A_3(T_p - T_i)^{\frac{1}{3}} \qquad (3)$$

where T_p and T_i are respectively the absolute temperatures of the surface of the panel and the inside air, and

$$A_3 = 0.135\,(\beta\, g\, P_{rm})^{\frac{1}{3}}\,\frac{\lambda}{v^{2/3}} \qquad (4)$$

where β is the coefficient of volume expansion, g is the acceleration due to gravity, λ is the coefficient of thermal conductivity, v is the coefficient of kinematic viscosity.

The quantity of heat given off by the rear portion of the panel is computed by the following expression:

$$Q_a = (l + 0.3)\,(h + 0.15)\,K\,1.1\,(t_i - t_e) \text{ kcal per hr} \qquad (5)$$

where K is the coefficient of transmission of the outside wall, and t_e is the temperature of the outside air.

To permit comparison of the service of radiators and flush heating panel, the following expression has been proposed for the coefficient of heat emission of the latter:

$$K_p = \frac{Q}{(t_{av} - t_i)\,S_f} \text{ kcal per m}^2\text{hr per deg C} \qquad (6)$$

where t_{av} is the average temperature of the heating medium in the panel, and S_f is the area of the effective frontal surface of the panel.

Analysis of the variations of this quantity K_p and the coefficient of heat emission of a radiator as a function of the difference between temperature of fluid (t_{av}) and temperature of room (t_i) has shown that flush heating panels can operate with variations in temperature of heating fluid following the familiar curve.

This important result makes it possible to connect heating systems with flush panels to municipal heat supply service, and to equip a building heated with one central plant with both radiators and heating panels placed under windows.

The fact that the thermal inertia of concrete heating panels is somewhat higher than that of cast-iron radiators is not critical, as has been shown by laboratory tests and observation under ordinary conditions of operation.

Before heating systems with concrete heating panels

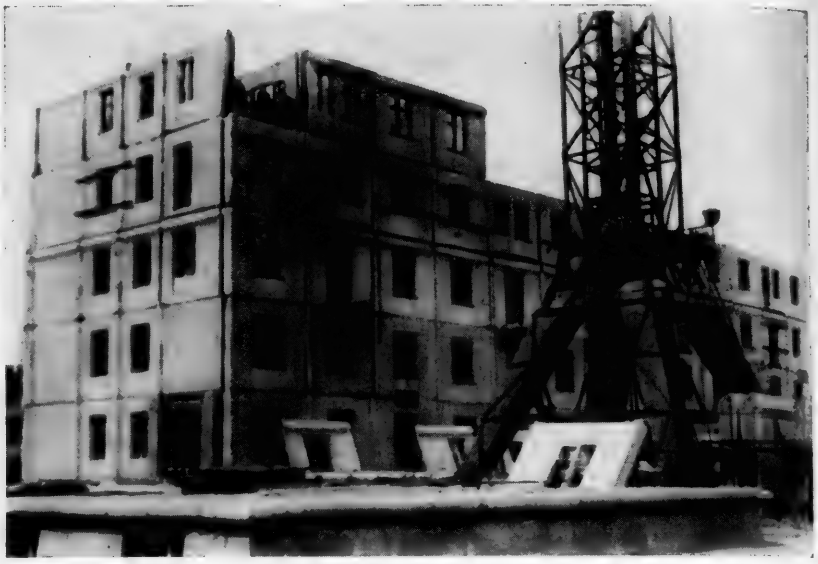


Fig. 8. Erection of building from large prefabricated panels, the outside wall panels equipped with risers and enclosed heating elements.

were introduced into construction practice, close attention was devoted to the problem of occurrence of cracks in the surface of the panels. Such cracks began to be noticeable at feed-water temperatures above 80C[176F].

However, it was found that such cracks do not at all impair the thermal and mechanical properties of the panels. Service tests showed them to be of minor importance, inasmuch as papering of the panels (which diminishes the heat yielded by about 5%) or repainting with water or oil paint renders the cracks in the panels quite imperceptible.

Vertical and surface distribution of temperature in rooms heated with heating panels placed beneath the windows has been perfectly satisfactory.

The measurements performed have shown that the vertical temperature gradient in all floors is less than or equal to 0.34 deg C per m [0.19 deg F per ft].

Rising hot-air currents near heating panels placed under windows localize the effect of falling cold currents from the window. At the same time, the field of intensity of radiation, measured with a radiometer in a vertical plane perpendicular to the window and passing through its median vertical centerline, is stronger, under otherwise like conditions for a radiator than for a panel.

The favorable information reported and the results of studies of heating systems with concrete heating panels placed beneath windows have led to recommendations of their extensive use in modern industrial construction.

Fabrication of outside wall panels with heating elements has not occasioned any difficulty under actual conditions. Construction and service experience with these systems has confirmed their desirable features; they consequently find application not only in large-panel construction but also in conventional brick construction, where the factory-made concrete heating panels are set in place during the bricklaying work.

Figure 8 shows a building being constructed of large prefabricated panels, using the type shown in Part 1.

Figure 9 shows construction of a brick building with heating panels placed under the windows and installed as the masonry work progresses.

The highly favorable results of using panel heating in buildings constructed of large prefabricated panels, and similarly favorable experience gained in the course of

Fig. 9. Erection of brick buildings with heating panels under windows.

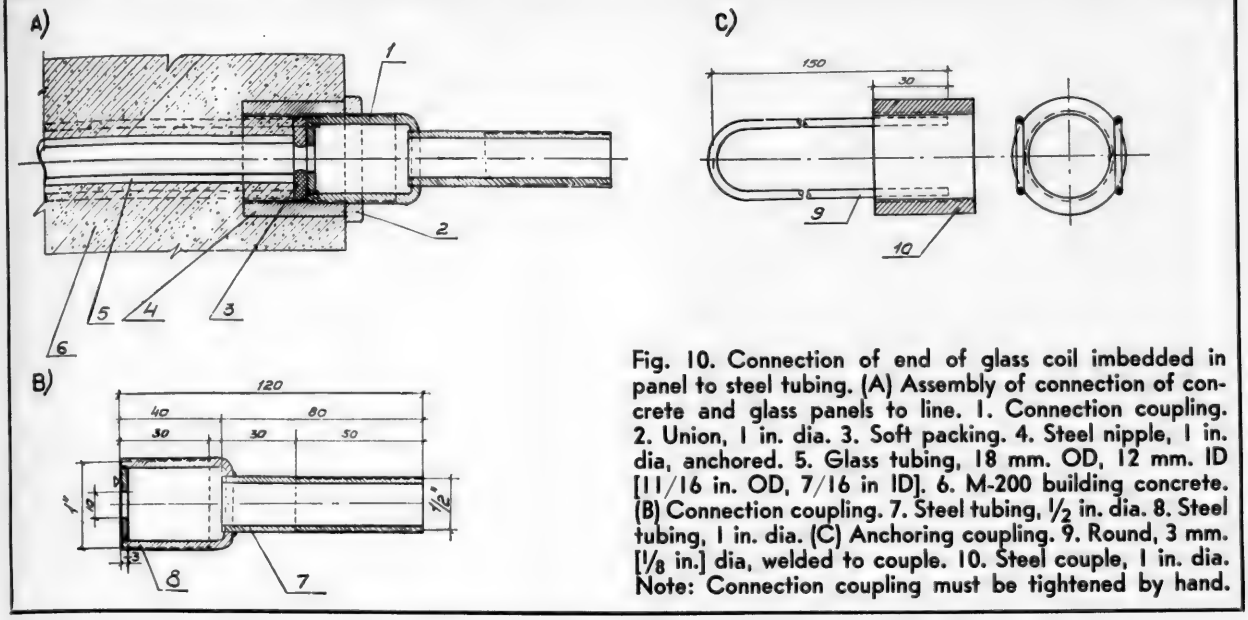


Fig. 10. Connection of end of glass coil imbedded in panel to steel tubing. (A) Assembly of connection of concrete and glass panels to line. 1. Connection coupling. 2. Union, 1 in. dia. 3. Soft packing. 4. Steel nipple, 1 in. dia, anchored. 5. Glass tubing, 18 mm. OD, 12 mm. ID [11/16 in. OD, 7/16 in ID]. 6. M-200 building concrete. (B) Connection coupling. 7. Steel tubing, 1/2 in. dia. 8. Steel tubing, 1 in. dia. (C) Anchoring coupling. 9. Round, 3 mm. [1/8 in.] dia, welded to couple. 10. Steel couple, 1 in. dia. Note: Connection coupling must be tightened by hand.

operation of similar systems installed by building trades methods in many structures in Russia ever since the beginning of the present century, fully justify the extensive development planned for this method of heating.

Heating systems in which the heating elements are set horizontally between stories in the floors or ceilings are not very widespread in the U.S.S.R., having been used largely in hospitals. Limited use of such systems is due to the slightly increased consumption of metal resulting from the need to maintain lower surface temperatures on floors and ceilings. Also, it is difficult to combine the hollow or ribbed floor and ceiling elements commonly used in the U.S.S.R. with heating batteries of steel tubing.

Air venting of a heating system is more difficult to provide with a horizontal arrangement of heating pipes in ceilings and floors than when the heating elements are placed vertically in outside walls or partitions.

To cut down the expense of steel tubing, experimentation now in progress has as its goal its replacement by pyrex glass coils. At the present time, a panel and method of connecting ends of a glass coil to steel supply lines have already been devised (Fig. 10).

As may be seen in the drawing, the connection is made tight with a soft packing (replaceable when required) between the ends of the steel and glass tubing. In order to give the panels the necessary strength, they are reinforced with iron wire screening.

Concrete for such glass-tube panels is poured on a vibrating table in the following sequence of operations. First the protecting layer of concrete is poured and leveled, with reinforcing screening. Then the glass coil is laid on top, with steel couplings fixed to the ends, and lastly the top layer of concrete is poured, while vibrating the whole.

Fabrication of a trial lot of concrete and glass panels 1.7 m [5 ft, 7 in.] in length, 0.7 m [2 ft, 4 in.] in height and 75 mm [3 in.] in thickness, transport of the panels, installation, and operation for one heating season in a hot-water heating system installed in the basement of a six-story building, have given very satisfactory results. Thermal analysis showed that replacement of steel tubing by glass tubing reduced the quantity of heat given off by the panels by 5%. Considering the favorable result of tests on this experimental lot of concrete panels with glass coil, it is planned in the present year to execute an experimental heating installation comprising 400 to 500 of these units.

Advance engineering and estimating calculations have shown that in wholesale use of concrete and glass panels instead of radiators, there is not only a substantial saving of metal but also a reduction of around 20 to 25% in initial cost of heating installation.

Figure 11 shows a glass coil used in a concrete panel. In view of the spread of building construction with

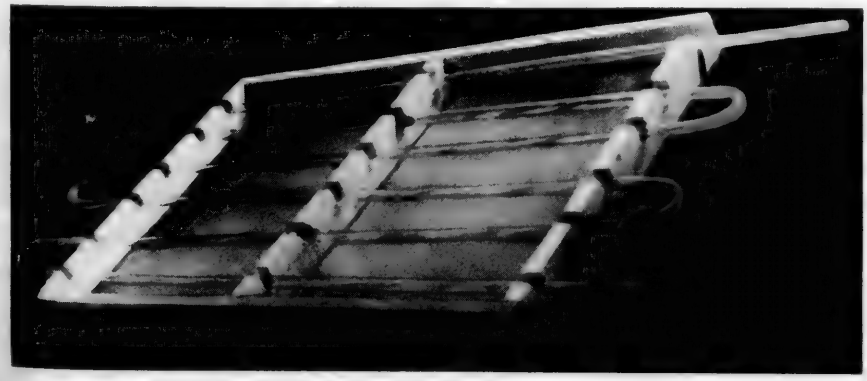


Fig. 11. Glass coil.

Fig. 12. Erection of seven-story residential building with hot-air heating, combined with exhaust ventilation.

large prefabricated elements, where the gaps can be used as air circulation ducts, there is much inducement to equip multistory buildings with hot air heating systems.

A system with hot-air-heated ceilings and floors (nominal temperature of ceiling surface 30C[86F], floor surface 22C[71.6F]) has been installed experimentally in a residential building in Sevastopol.

Analysis of this system under normal operating conditions confirmed that such a heating system deserved consideration; but it also revealed an undesirable amount of leakage in the hot-air passages of the resulting system.

At present, an experimental apartment house is being completed (80,000 cu m [2,824,800 cu ft] of space) with air heating combined with blower ventilation in living rooms and exhaust ventilation in kitchens and lavatories. This building, seen under construction in Fig. 12, has a heating system based on air propelled by centrifugal blowers in the central portion and four natural exhaust ventilating systems in the wings of the building.

Both systems have their advantages and disadvantages. In the forced exhaust system, the air is freed from dust and humidified before being sent to the heated apartments. The natural exhaust system is simpler in operation because it operates without noisy blowers and involves no extra power consumption.

Supply of air to each room of the experimental building is provided by an individual asbestos cement duct connected to the main distribution line and set in the lengthwise thickness of the interior brick wall. Compensation of heat losses in apartments is provided by the hot air, heated to a temperature of 80C[176F] maximum, and by the warm surface of the walls in which hot-air ducts are placed. Conventional radiators are used for kitchen heating.

Hot air supplied to living quarters to replace the air an average of about once an hour is regulated at installation by means of diaphragms placed in the ducts at the point of connection to the distribution main, which is built to permit access for maintenance.

Heating of various quarters in operation is regulated by means of registers integral with the inlet grills.

Engineering and estimating calculations made for this heating system and comparison of the results with those for radiator heating systems have shown that the former can be put in at considerably less expense.

An experimental hot-air heating system combined with ventilation is now being planned for a school being built in four stories with large prefabricated panels.

In this particular case, the use of such a system will evidently save operating expense because during the night, on holidays and in vacations, a lower temperature can be maintained in the buildings, and promptly raised to the desired level before classes open by air heating in closed circuit.

The spaces in the blocks used to construct the inside walls of the school, constructed of large prefabricated blocks, can readily be used as air circulation ducts.

(The concluding part of Central Heating in the USSR *will appear in a subsequent issue.)*

Specify Insulation Performance?

The usual insulation specification describes a material that the designer expects will perform in a certain way under design conditions. If the specified material is furnished and fails to perform as expected, the supplier or installer has nevertheless performed his duties.

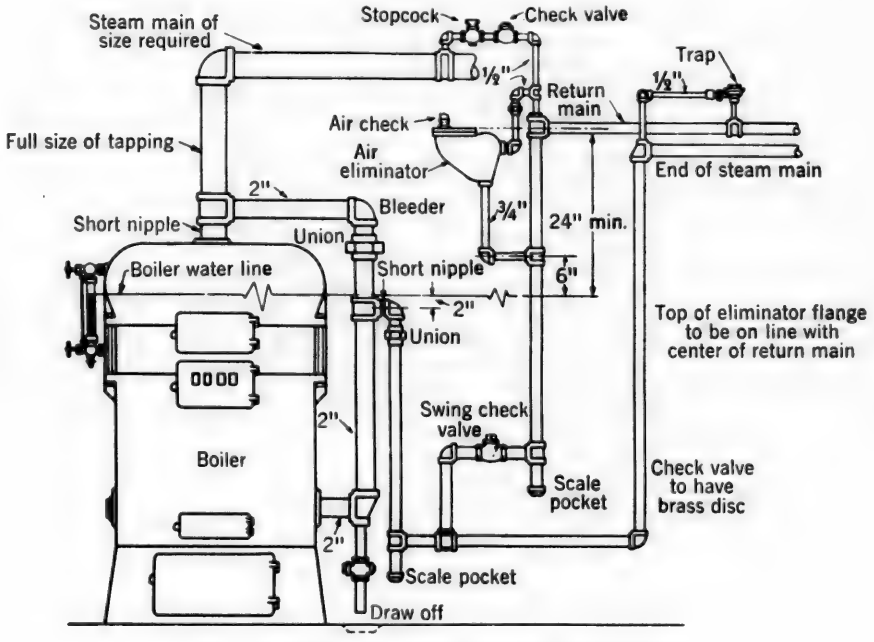
At a recent meeting of Committee C-16 on Thermal Insulating Materials, American Society for Testing Materials (ASTM), a new philosophy of specifications, based on performance, was presented. The present specifications under the jurisdiction of the Committee are based on material composition. As one prominent member put it, too often the specifications *describe* the material rather than *prescribe* the values below which the material should not go.

It is further suggested that all requirements should be fully covered by ASTM test methods and that the demand for materials specifications, when required, should come from the consumer. By this philosophy, the ASTM *Bulletin* explains, materials would be divided into classes according to performance requirements as, for example, temperature range. Some materials so classified might meet requirements of more than one class.

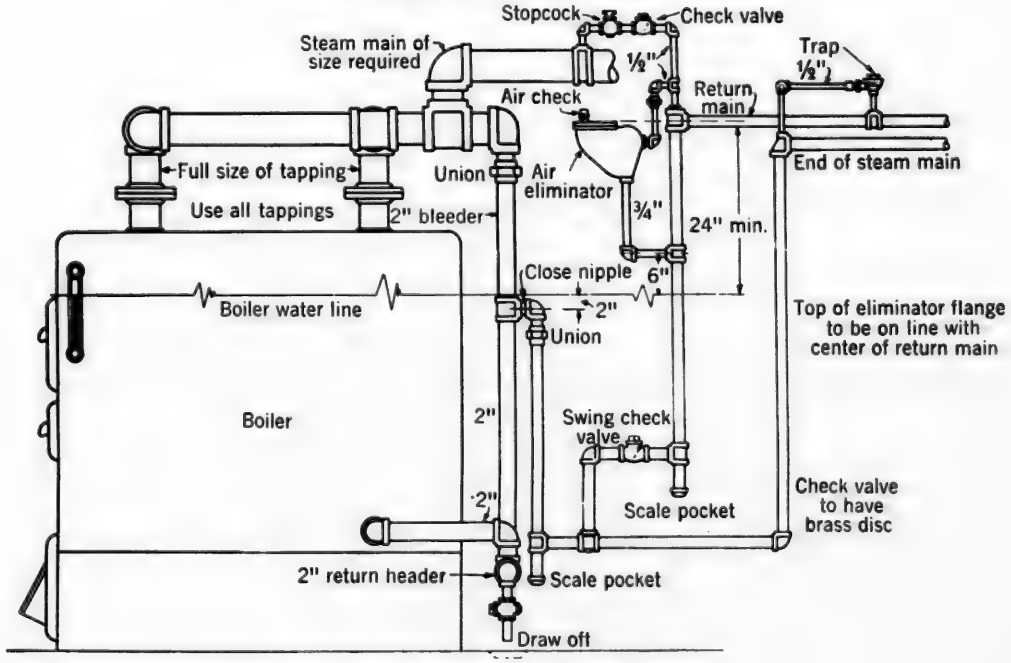
It is planned to distribute examples of suggested performance specifications to the members of the committee, to be followed by more definite discussion at future meetings. A proposed reorganization of the committee would fit into the scheme for specification revisions. The reorganization would be based, in part, on the classification of materials. Sub-committees under the proposed reorganization would include those to deal with pre-molded insulations (pipe and block); formed in place materials (wools, plastics, and cements); blanket, board and sheet; coverings, coatings and attachments; etc.

Data should be forthcoming in the near future to enable a uniform rating of mastic adhesives for thermal insulation, ASTM reports. Tests are planned to study weathering, adhesion, and the stability of adhesive coatings. A proposed recommended practice for prefabrication or field fabrication of thermal insulation fitting covers is approved for ballot. In the field of special thermal properties, a proposed method of test for mechanical stability, and for measuring total emissivity and maximum use temperature for thermal insulation is approved for ballot.

AIR ELIMINATOR PIPING

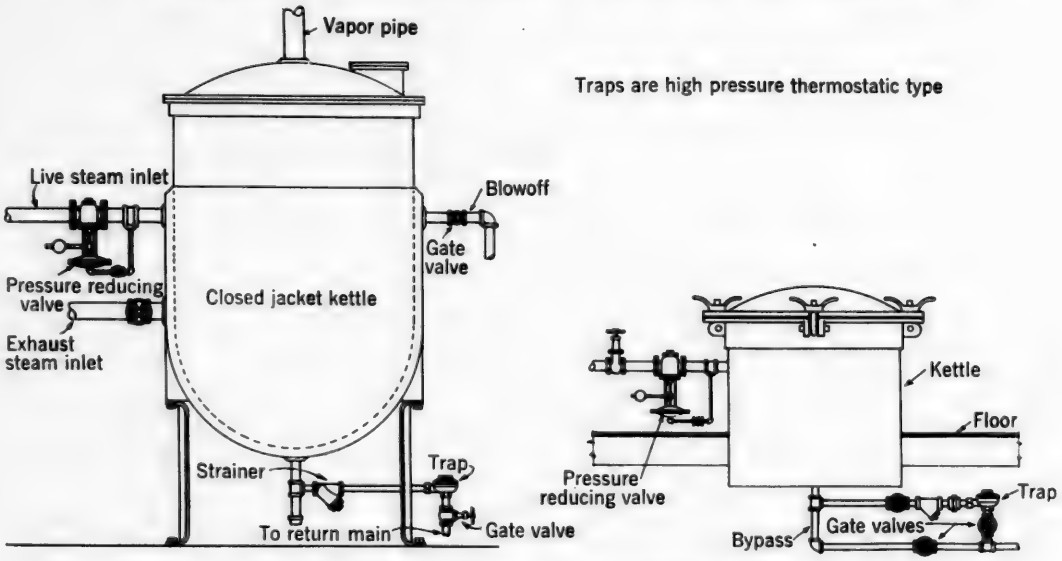


AIR ELIMINATOR ON INSTALLATIONS USING BOILER WITH ONE SUPPLY TAPPING

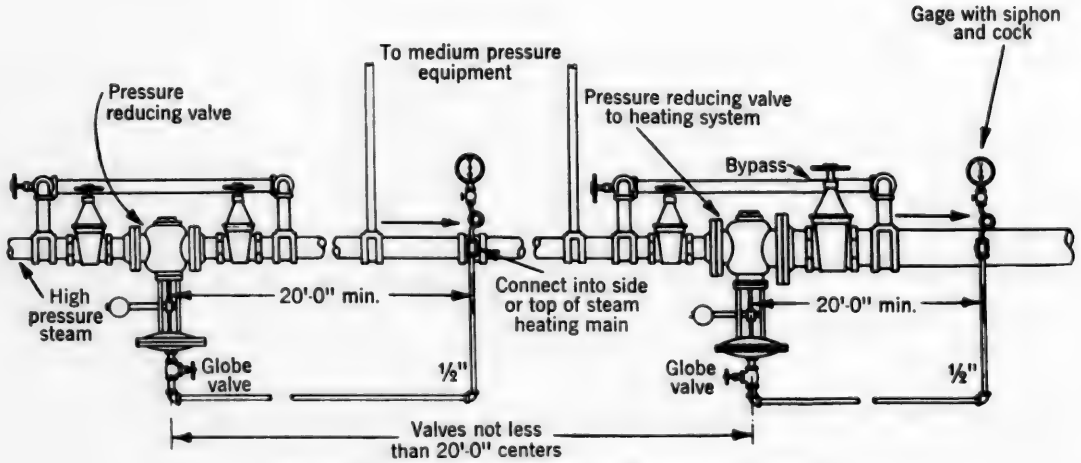


AIR ELIMINATOR ON INSTALLATIONS USING BOILER WITH TWO OR MORE SUPPLY TAPPINGS

PRESSURE REDUCING VALVE HOOKUPS



PRESSURE REDUCING VALVES, THERMOSTATIC TRAPS AND STRAINERS APPLIED TO PROCESS KETTLES



TYPICAL INSTALLATION OF PRESSURE REDUCING VALVES

Drawings on This and Reverse Page
Courtesy of Dunham-Bush, Inc.
From Dunham Product Application Manual

AIR CONDITIONING, HEATING AND VENTILATING'S Reference Section

Cooling Degree-Days

EARL C. THOM
Meteorologist, United States Weather Bureau, Washington, D. C.

There has long been a need for an estimating unit for summer cooling similar to the degree-day used for heating. With cooling, however, the problem of formulating such a unit is complicated by the fact that both dry-bulb and wet-bulb temperatures must be taken into account. The author has developed such a unit, based on the Discomfort Index. This concept is reviewed in this article which also includes 5-year averages of Cooling Degree-Days for the U.S., these having only been calculated during recent months.

THIS is the third of a series of articles dealing with the development and practical application of a system for compiling cooling degree-days. At present there is no generally accepted system for this purpose. A few examples of the various plans which have been proposed have been given in previous articles.[1] The basic work presented in this series has been done to lay a foundation for meeting three recognized needs:

(1) A system which would provide a means of comparing the degree of discomfort from month to month and from season to season at one location. Such a system would also form a basis for comparing the degree of discomfort of one location with another;

(2) A system which would show the relative need for air-conditioning in various areas and which, when used with population and average annual income figures, would provide a relatively simple, logical measure of the potential for air-conditioning sales;

(3) A cooling degree-day system which would be a useful measure of the amount of energy required to operate existing air-conditioning installations from month to month and from season to season. When normals for such a system are established it would then be possible to explain with better logic the variations in energy used by an air-conditioning installation. When such a system is adopted, there is the likelihood that it would be possible to predict the cooling degree-day values for each coming month.

A large utility company has found that excess of the daily average of the dry-bulb and wet-bulb temperatures over a selected base value provided them locally with a useful cooling degree-day measure. In the usual observed ranges of dry-bulb and wet-bulb temperature readings these average values were found to agree quite well numerically with Effective Temperatures. Since both the temperature and the amount of moisture in the air affect human comfort, the descriptive name Discomfort Index was given to the value. In working with this new index it was found that it departed somewhat from the corresponding Effective Temperature at both extremes of the temperature range. Work to improve the Discomfort Index has been done by J. F. Bosen, Office of Climatology, United States Weather Bureau, Washington, who has provided two simple linear equations:

$$(1)\quad DI = 0.4\,(t_d + t_w) + 15$$

$$(2)\quad DI = .55t_d + .2t_{dp} + 17.5$$

DI = Discomfort Index
t_d = Dry bulb temperature
t_w = Wet bulb temperature
t_{dp} = Dew point temperature

All t values are in degrees F, and the t values in each equation are simultaneous readings. Using these simple linear equations the resulting Discomfort Index values closely parallel the corresponding Effective Temperature reading in the usual ranges of summertime temperature and relative humidity over the United States and they are also sufficiently accurate for all practical uses under the most extreme conditions which are likely to be observed. The second equation was de-

[1] See "Measuring the Need for Air Conditioning," by Earl C. Thom, Air Conditioning, Heating and Ventilating, August, 1956, and "A New Concept for Cooling Degree-Days", by Earl C. Thom, Air Conditioning, Heating and Ventilating, June, 1957.

FIG. 1. AVERAGE ANNUAL TOTAL NUMBER OF COOLING DEGREE-DAYS

Period: 1953-1957, incl. Base: Discomfort Index 60

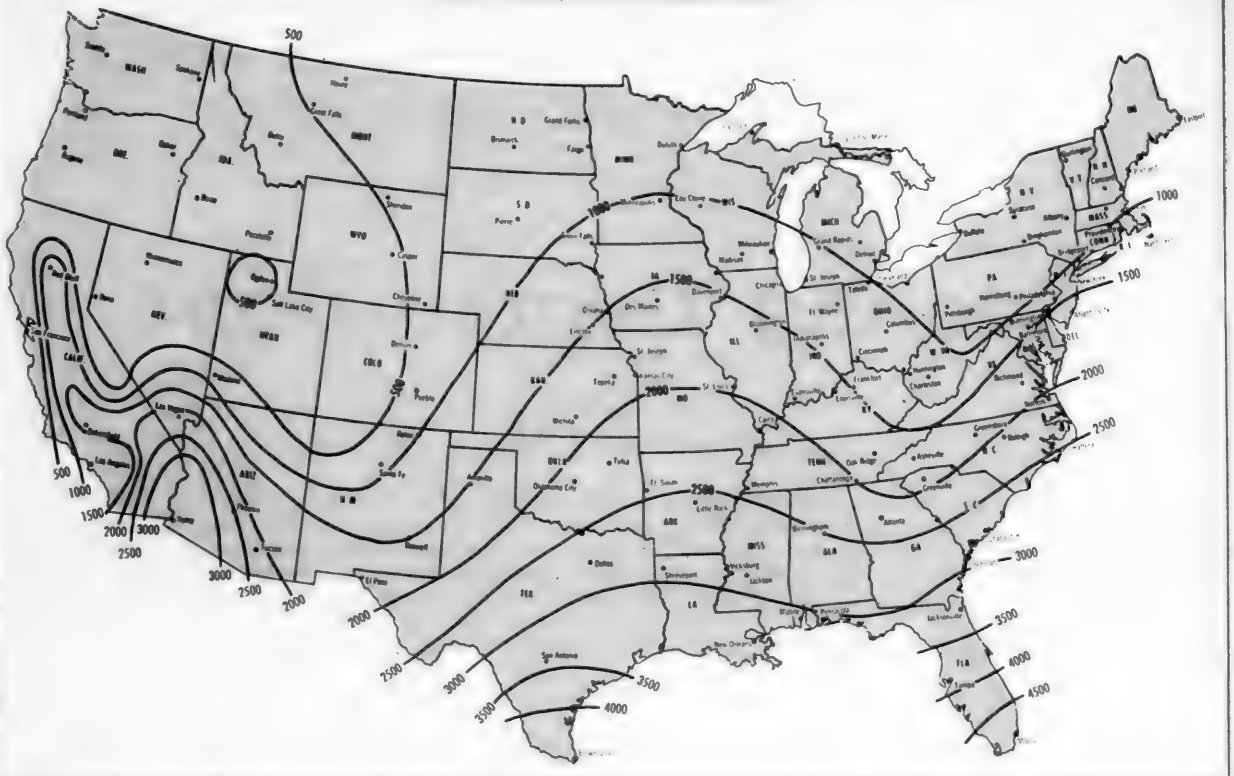


FIG. 2. AVERAGE JULY TOTAL NUMBER OF COOLING DEGREE-DAYS

veloped to provide for convenient future use of the dew point temperature readings which will be provided directly by the new telepsychrometers soon to be put into use at over a hundred stations of the Weather Bureau.

The Discomfort Index has been used as the basis for the cooling degree-day system used in this and previous papers. This is done by computing the average Discomfort Index for the day and subtracting from it a previously determined base figure. Ideally, the average Discomfort Index for the day should be the mean of these values obtained from the 24 hourly readings of the dry-bulb temperature and the wet-bulb (or dew-point) temperature. However, as shown later, an average of the Discomfort Index values determined from four observations taken at 6-hour intervals can be used with satisfactory results. The base figure of 60 has been adopted for this study but this selection is subject to modification as discussed in a later paragraph. Cooling degree day values can of course be accumulated into monthly and annual totals as desired.

Such monthly and annual cooling degree day totals, with corresponding 5-year averages, are shown in Table 2 for 55 selected stations in the United States for the period from January, 1953, through December, 1957. Figure 1 is an isoline base map of the United States, based on the average 5-year annual total number of cooling degree days at the 55 stations shown in Table 2.

Data presented in this article have been compiled for the most recent 5-year period. Similar data presented for a single year have been of interest and many readers have suggested that the study be extended to cover a longer period.

It is recognized that for some uses a system based on conditions during a selected portion of the day would more adequately meet the requirements. The use of the Discomfort Index can, of course, be made completely flexible with normals established as may be needed for various portions of the day. Examples of such diurnal Discomfort Index computations have previously been published for Baltimore and in a somewhat different form for nine other stations.

The maximum discomfort to be expected at a location is of interest to the engineers who are designing air conditioning installations. Table 1 gives samples of the maximum Discomfort Index as compiled from data recorded on particular dates at selected stations, together with the computed cooling degree-day values.

Figure 2 shows that maximum discomfort during July, as indicated by a 5-year average July cooling degree-day total of 550 or over, occurs in most of the western two thirds of Louisiana, those parts of the south half of Arkansas where the elevations are below 500 feet, many of the lower elevation areas in the southern one third of Oklahoma, and in most of the eastern half of Texas where the elevations are below 1000 feet as well as in all of the desert areas having elevations of less than 1000 feet which lie in the southwestern Arizona and in the extreme southeastern tip of California. Thus Fig. 2 emphasizes quite well the areas where maximum summertime discomfort is to be expected.

The material presented should be useful for reference and study but there are a number of refinements which may also need to be given consideration. The Discomfort Index value should prove basically satisfactory for a cooling degree-day system but more work needs to be done to ascertain whether or not 60 is the best possible base. Then there is the consideration of the effects of radiation and of surface wind speed on human comfort. It is believed that air-conditioning installations of office buildings, hotels, and hospitals are of major interest. Since the variations in radiation will have less effect on the comfort of the occupants of these buildings, such structures usually being well insulated, no doubt the variations of temperature and moisture content of the lower layers of the atmosphere, as expressed by these cooling degree-day values, will be found to correlate sufficiently well with the energy needed to operate air-conditioning equipment without considering the effects of radiation. The larger buildings cannot be constructed so that the outside surface wind movement can be utilized to decrease discomfort materially and it appears logical, therefore, to leave the surface air movement out of any cooling degree-day plan for larger structures. On individual homes the effect of the variations in radiation and in surface wind speed may be of somewhat more interest. Even here, however, the circulation of air from the outside cannot be depended upon to decrease discomfort materially in all parts of the house at the same time and the insulation of the house most frequently stays as it was at the time of construction.

To test the correlation between the proposed cooling degree-day system and the energy used by air-conditioning installations it is desirable to have data showing the electric current used by such installations only. Since air-conditioning equipment usually does not have separate meters, such data are not easily obtainable. It is hoped that the tabular material presented will be of definite value particularly to utilities in the cities for which data are given. The author would appreciate the opportunity of cooperating with operating utilities in the further study of this problem.

TABLE 1—SELECTED EXAMPLES OF MAXIMUM DISCOMFORT CONDITIONS†

Station	Date	Maximum Dry Bulb Temperature, Deg. F	Discomfort Index at Time of Maximum Temperature	Cooling Degree-Day Value for This Date
Yuma, Ariz.	July 31, 1957	119	92	25
Yuma, Ariz.	June 24, 1957	120	91	20
Kansas City, Mo.	July 13, 1954	112	89	23
Charleston, S. C.	Aug. 17, 1954	102	87	20
Bakersfield, Calif.	Aug. 3, 1955	110	87	18
Miami, Fla.	Aug. 6, 1954	98	86	20
Oklahoma City, Okla.	July 12, 1954	107	86	19
New Orleans, La.	July 16, 1954	96	85	19
North Platte, Neb.	July 29, 1955	103	85	17
Chicago, Ill.	July 27, 1955	100	84	15
Los Angeles, Calif.	Aug. 31, 1955	101	84	9
Raleigh, N. C.	July 3, 1955	98	83	15
Las Vegas, Nev.	Aug. 30, 1955	108	83	13

† Random selections of hot days from data for the 55 stations during the 1953-1957 period. It follows that the most severe discomfort condition for the stations shown may not appear here and also that more extreme discomfort is likely to have occurred in other years and at other locations.

TABLE 2—MONTHLY AND ANNUAL TOTAL NUMBER OF COOLING DEGREE DAYS, 1953-1957, WITH AVERAGES

(Monthly totals of less than 5 are omitted from this table.)

Region and City	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
EASTERN SEABOARD														
Rochester, N. Y.	1953	0	0	0	0	41	203	287	225	107	0	0	0	863
(Elev. 543 ft)	1954	0	0	0	7	39	209	233	179	92	67	0	0	826
	1955	0	0	0	0	74	173	349	343	86	27	0	0	1052
	1956	0	0	0	0	51	167	225	217	82	8	12	0	762
	1957	0	0	0	46	42	238	248	182	87	0	0	0	843
5 year average		**0**	**0**	**0**	**11**	**49**	**198**	**268**	**229**	**91**	**20**	**2**	**0**	**868**
Boston, Mass.	1953	0	0	0	0	29	216	302	264	167	20	0	0	998
(Elev. 15 ft)	1954	0	0	0	5	31	154	271	240	116	76	0	0	893
	1955	0	0	0	0	80	196	403	364	123	21	0	0	1187
	1956	0	0	0	0	20	214	279	271	91	13	0	0	888
	1957	0	0	0	9	61	240	302	217	178	13	0	0	1020
5 year average		**0**	**0**	**0**	**0**	**3**	**44**	**204**	**311**	**271**	**135**	**29**	**0**	**0**	**997**
New York, N. Y.	1953	0	0	0	7	89	233	357	318	201	34	0	0	1239
(Elev. 10 ft)	1954	0	0	0	20	36	240	333	287	170	115	0	0	1201
	1955	0	0	0	7	96	190	450	403	173	56	0	0	1375
	1956	0	0	0	13	45	225	303	333	124	37	0	0	1080
	1957	0	0	0	29	83	287	341	287	220	23	0	0	1270
5 year average		**0**	**0**	**0**	**0**	**15**	**70**	**235**	**357**	**326**	**178**	**53**	**0**	**0**	**1234**
Washington, D. C.	1953	0	0	0	23	219	345	442	380	213	53	0	0	1675
(Elev. 14 ft)	1954	0	0	0	80	114	315	419	318	293	146	5	0	1690
	1955	0	0	0	34	175	241	519	457	248	61	6	0	1741
	1956	0	0	0	33	109	315	388	372	175	50	40	0	1482
	1957	0	0	0	83	178	375	411	349	284	19	0	0	1699
5 year average		**0**	**0**	**0**	**51**	**159**	**319**	**436**	**375**	**243**	**66**	**10**	**0**	**1659**
Raleigh, N. C.	1953	0	5	20	70	310	360	457	395	240	142	15	0	2014
(Elev. 400 ft)	1954	9	6	18	113	119	345	426	419	315	136	0	0	1906
	1955	0	0	41	91	248	248	473	457	300	64	20	5	1947
	1956	0	0	15	57	204	345	442	419	218	88	24	20	1832
	1957	6	18	0	125	223	383	427	364	323	32	34	0	1935
5 year average		**3**	**6**	**19**	**91**	**221**	**336**	**445**	**411**	**279**	**92**	**19**	**5**	**1927**
Hatteras, N. C.	1953	0	0	14	85	318	383	512	473	398	218	43	15	2459
(Elev. 7 ft)	1954	6	12	31	156	215	428	496	512	405	221	31	0	2513
	1955	0	0	50	119	235	315	535	535	405	191	37	0	2422
	1956	0	0	11	71	185	398	504	481	353	233	57	57	2350
	1957	0	11	7	155	283	435	465	442	428	117	62	23	2428
5 year average		**1**	**5**	**23**	**117**	**247**	**392**	**502**	**489**	**398**	**196**	**46**	**19**	**2435**
Charleston, S. C.	1953	25	17	76	126	403	435	504	465	375	126	42	33	2627
(Elev. 9 ft)	1954	32	26	72	180	225	450	518	527	413	179	35	13	2670
	1955	6	28	109	167	341	360	502	502	323	134	41	19	2532
	1956	0	47	50	119	326	413	512	481	285	178	43	64	2518
	1957	34	39	26	144	315	435	481	473	398	108	86	10	2549
5 year average		**19**	**31**	**67**	**147**	**322**	**419**	**503**	**489**	**359**	**145**	**49**	**28**	**2578**
Tallahassee, Fla.	1953	36	29	129	158	426	480	504	481	413	207	63	61	2987
(Elev. 64 ft)	1954	28	33	107	270	264	458	535	558	465	213	51	20	3002
	1955	21	29	147	210	349	383	488	512	443	164	63	24	2833
	1956	0	78	76	120	364	403	481	496	338	233	59	85	2733
	1957	88	91	50	207	357	465	512	488	420	170	120	20	2988
5 year average		**35**	**52**	**102**	**193**	**352**	**438**	**504**	**507**	**416**	**197**	**71**	**42**	**2909**
Jacksonville, Fla.	1953	56	52	153	192	364	495	535	512	360	250	72	83	3124
(Elev. 18 ft)	1954	43	51	134	285	295	503	550	558	480	240	58	27	3224
	1955	27	53	175	248	388	428	535	535	488	248	52	29	3206
	1956	0	125	99	165	411	443	543	535	383	295	97	107	3203
	1957	96	124	94	242	419	488	550	524	495	230	172	38	3472
5 year average		**44**	**81**	**131**	**226**	**375**	**471**	**543**	**533**	**441**	**253**	**90**	**57**	**3245**
Tampa, Fla.	1953	94	111	235	256	465	510	543	527	480	295	164	172	3852
(Elev. 19 ft)	1954	100	74	142	345	372	503	519	558	503	297	127	48	3588
	1955	80	91	180	285	411	428	488	527	495	303	152	82	3522
	1956	32	150	145	218	450	473	519	527	420	341	140	169	3584
	1957	149	168	153	300	426	503	550	512	480	271	218	73	3803
5 year average		**91**	**119**	**171**	**281**	**425**	**483**	**523**	**530**	**476**	**301**	**160**	**109**	**3669**

Region and City	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Miami, Fla.	1953	204	252	341	375	504	503	558	574	533	395	323	286	4848
(Elev. 8 ft)	1954	245	176	244	405	481	488	558	589	540	426	263	128	4543
	1955	145	191	295	360	442	420	527	574	525	411	300	248	4438
	1956	124	261	256	323	488	488	558	558	495	457	233	146	4387
	1957	250	287	258	405	481	525	543	543	540	411	360	187	4790
5 year average		**194**	**233**	**279**	**374**	**479**	**485**	**549**	**568**	**527**	**420**	**296**	**199**	**4603**
SOUTHERN SECTION														
Atlanta, Ga.	1953	0	0	20	49	318	434	450	426	270	98	10	0	2075
(Elev. 977 ft)	1954	0	0	41	142	131	390	496	496	360	141	0	7	2204
	1955	0	5	62	121	287	285	473	481	338	82	31	9	2174
	1956	0	12	28	77	289	368	465	450	263	121	19	39	2131
	1957	23	38	0	141	268	413	450	395	330	77	33	0	2168
5 year average		**5**	**11**	**30**	**106**	**259**	**378**	**467**	**450**	**312**	**104**	**19**	**11**	**2152**
Montgomery, Ala.	1953	21	8	79	113	411	519	512	504	315	174	24	14	2694
(Elev. 198 ft)	1954	21	14	83	218	202	473	550	558	413	174	20	12	2738
	1955	15	22	142	190	357	368	502	527	428	78	53	27	2709
	1956	0	48	44	106	372	420	496	519	308	171	27	68	2579
	1957	49	77	21	205	349	480	519	496	383	103	73	0	2755
5 year average		**21**	**34**	**74**	**166**	**338**	**452**	**516**	**521**	**369**	**140**	**39**	**24**	**2694**
Jackson, Miss.	1953	17	8	88	110	388	540	527	481	338	171	25	0	2693
(Elev. 315 ft)	1954	23	28	58	233	209	495	550	558	398	210	14	13	2789
	1955	12	17	130	195	364	360	488	488	413	99	72	32	2670
	1956	0	50	50	107	372	413	512	481	300	147	60	47	2535
	1957	37	70	18	184	285	458	512	481	338	107	75	18	2583
5 year average		**18**	**35**	**69**	**166**	**324**	**453**	**518**	**498**	**357**	**147**	**49**	**22**	**2656**
Shreveport, La.	1953	24	8	130	127	364	570	550	527	383	228	25	0	2936
(Elev. 252 ft)	1954	28	24	77	256	241	518	620	597	443	257	13	10	3084
	1955	21	31	110	223	388	405	543	519	450	166	78	28	2962
	1956	22	54	57	137	395	450	566	550	360	198	49	47	2885
	1957	21	48	16	176	341	390	558	504	345	149	62	24	2634
5 year average		**23**	**33**	**78**	**184**	**346**	**467**	**567**	**539**	**396**	**200**	**45**	**22**	**2900**
New Orleans, La.	1953	56	44	191	226	450	548	550	543	443	246	77	28	3402
(Elev. 9 ft)	1954	52	58	132	278	287	495	543	550	473	280	47	40	3235
	1955	34	56	205	270	519	443	527	550	495	225	98	66	3488
	1956	28	103	118	200	349	450	543	527	420	310	121	119	3288
	1957	141	136	85	237	403	495	581	543	428	211	133	24	3417
5 year average		**62**	**79**	**146**	**242**	**402**	**486**	**549**	**543**	**452**	**254**	**95**	**55**	**3365**
Ft. Worth, Texas	1953	9	0	92	95	309	563	540	528	368	203	17	0	2719
(Elev. 688 ft)	1954	10	15	55	236	239	495	605	589	428	246	13	10	2941
	1955	15	20	90	201	372	413	558	527	443	172	76	8	2895
	1956	13	23	63	112	395	480	612	550	390	225	21	21	2905
	1957	20	28	17	138	302	465	597	543	338	134	29	17	2628
5 year average		**13**	**17**	**63**	**156**	**323**	**483**	**582**	**547**	**393**	**196**	**30**	**11**	**2814**
Abilene, Texas	1953	0	0	54	84	268	525	512	481	330	154	8	0	2416
(Elev. 1759 ft)	1954	0	9	35	177	220	398	543	543	368	193	7	0	2493
	1955	11	11	48	166	310	390	504	481	405	152	28	7	2513
	1956	0	16	46	114	310	465	504	481	330	172	12	6	2456
	1957	10	6	0	141	253	390	519	488	225	50	9	0	2091
5 year average		**4**	**8**	**37**	**136**	**272**	**434**	**516**	**495**	**332**	**144**	**13**	**3**	**2394**
San Antonio, Texas	1953	12	28	184	198	357	525	584	527	368	256	62	12	3113
(Elev. 782 ft)	1954	50	31	113	297	336	488	550	558	465	291	39	54	3272
	1955	27	54	154	256	411	458	527	527	473	194	100	17	3198
	1956	25	70	90	185	403	503	535	481	405	271	50	48	3066
	1957	41	113	91	196	349	420	558	558	390	210	74	42	3042
5 year average		**31**	**59**	**126**	**226**	**371**	**479**	**551**	**530**	**420**	**244**	**65**	**35**	**3137**
Houston, Texas	1953	54	37	235	218	426	548	566	535	428	273	53	32	3405
(Elev. 41 ft)	1954	66	57	130	289	321	495	566	566	473	321	47	70	3401
	1955	28	58	224	240	403	443	543	543	488	243	128	60	3401
	1956	39	99	113	158	419	473	550	550	428	295	105	85	3314
	1957	100	123	98	252	398	457	558	558	420	236	134	67	3401
5 year average		**57**	**75**	**160**	**231**	**393**	**483**	**557**	**550**	**447**	**274**	**93**	**63**	**3383**
Laredo, Texas	1953	68	70	339	360	481	615	643	589	473	333	112	30	4113
(Elev. 500 ft)	1954	88	112	190	398	442	525	605	597	525	372	121	94	4069
	1955	43	105	272	375	519	548	589	605	510	310	135	50	4061
	1956	45	164	217	293	473	548	589	597	488	403	97	73	3987
	1957	85	193	186	292	465	548	620	605	480	309	120	82	3985
5 year average		**66**	**129**	**241**	**344**	**476**	**557**	**609**	**599**	**495**	**345**	**117**	**66**	**4044**

Region and City	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Brownsville, Texas	1953	119	137	364	375	496	585	605	589	488	380	193	93	4424
(Elev. 16 ft)	1954	189	161	223	383	426	533	566	581	533	411	225	123	4354
	1955	139	150	291	383	512	518	566	574	540	349	228	145	4395
	1956	129	200	238	360	457	488	535	558	465	411	142	150	4133
	1957	207	238	240	360	496	548	589	597	488	367	224	189	4543
5 year average		**157**	**177**	**271**	**372**	**477**	**534**	**572**	**580**	**503**	**384**	**202**	**140**	**4369**
NORTH CENTRAL AND MID-WEST														
Sault Ste. Marie, Mich.	1953	0	0	0	0	30	68	155	156	47	0	0	0	456
(Elev. 721 ft)	1954	0	0	0	0	0	75	102	106	11	0	0	0	294
	1955	0	0	0	0	8	106	271	245	34	0	0	0	664
	1956	0	0	0	0	0	79	64	119	12	0	0	0	274
	1957	0	0	0	0	0	70	130	83	28	0	0	0	311
5 year average		**0**	**0**	**0**	**0**	**8**	**80**	**144**	**142**	**26**	**0**	**0**	**0**	**400**
Fargo, N. Dak.	1953	0	0	0	0	36	168	248	295	46	11	0	0	804
(Elev. 895 ft)	1954	0	0	0	0	11	158	271	209	25	0	0	0	674
	1955	0	0	0	11	89	156	388	295	65	16	0	0	1020
	1956	0	0	0	0	22	248	209	211	27	8	0	0	725
	1957	0	0	0	9	24	86	364	221	33	8	0	0	745
5 year average		**0**	**0**	**0**	**4**	**36**	**163**	**296**	**246**	**39**	**9**	**0**	**0**	**793**
Minneapolis, Minn.	1953	0	0	0	0	74	266	295	310	67	49	0	0	1061
(Elev. 830 ft)	1954	0	0	0	5	20	258	341	240	62	0	0	0	926
	1955	0	0	0	6	96	186	426	364	98	25	0	0	1201
	1956	0	0	0	0	59	279	240	266	52	27	0	0	923
	1957	0	0	0	16	38	158	411	271	60	0	0	0	954
5 year average		**0**	**0**	**0**	**5**	**57**	**229**	**343**	**290**	**68**	**20**	**0**	**0**	**1012**
North Platte, Neb.	1953	0	0	0	0	33	279	341	295	105	17	0	0	1070
(Elev. 2779 ft)	1954	0	0	0	0	37	223	403	318	145	12	0	0	1138
	1955	0	0	0	8	62	127	419	372	134	17	0	0	1139
	1956	0	0	0	0	79	285	318	264	91	9	0	0	1046
	1957	0	0	0	0	26	160	388	333	47	18	0	0	972
5 year average		**0**	**0**	**0**	**2**	**47**	**215**	**374**	**316**	**104**	**15**	**0**	**0**	**1073**
Chicago, Ill.	1953	0	0	0	0	101	308	380	341	111	42	0	0	1283
(Elev. 610 ft)	1954	0	0	0	44	54	350	354	310	210	66	0	0	1388
	1955	0	0	0	17	95	212	481	403	162	34	0	0	1404
	1956	0	0	0	18	95	300	302	326	114	37	0	0	1192
	1957	0	0	0	45	71	257	388	318	109	7	0	0	1195
5 year average		**0**	**0**	**0**	**25**	**83**	**285**	**381**	**340**	**141**	**37**	**0**	**0**	**1292**
Columbus, Ohio	1953	0	0	0	10	147	308	364	302	113	25	0	0	1269
(Elev. 815 ft)	1954	0	0	0	70	67	320	341	302	200	105	0	0	1405
	1955	0	0	0	30	118	189	442	395	190	29	5	0	1398
	1956	0	0	0	21	109	276	341	318	110	35	7	0	1217
	1957	0	0	0	79	130	293	357	295	182	6	0	0	1342
5 year average		**0**	**0**	**0**	**42**	**114**	**277**	**369**	**322**	**159**	**40**	**2**	**0**	**1324**
Kansas City, Mo.	1953	0	0	7	27	171	495	488	426	248	114	5	0	1981
(Elev. 741 ft)	1954	0	0	0	76	91	414	630	481	316	87	0	0	2095
	1955	0	0	7	84	189	263	566	457	281	53	0	0	1900
	1956	0	0	9	41	232	390	481	457	228	114	7	0	1959
	1957	0	0	0	67	147	353	543	458	180	45	0	0	1793
5 year average		**0**	**0**	**5**	**59**	**166**	**383**	**542**	**456**	**251**	**83**	**2**	**0**	**1946**
St. Louis, Mo.	1953	0	0	0	34	194	473	473	395	215	83	0	0	1867
(Elev. 522 ft)	1954	0	7	0	114	112	413	535	457	280	114	0	0	2032
	1955	0	0	7	81	197	249	543	450	255	56	10	0	1848
	1956	0	0	12	41	200	370	434	434	202	87	13	0	1793
	1957	0	0	0	103	177	360	481	403	173	22	0	0	1719
5 year average		**0**	**1**	**4**	**75**	**176**	**373**	**493**	**427**	**225**	**72**	**4**	**0**	**1851**
Amarillo, Texas	1953	0	0	0	12	129	405	395	357	195	51	0	0	1544
(Elev. 3590 ft)	1954	0	0	0	45	79	308	434	395	240	97	0	0	1598
	1955	0	0	0	14	88	212	347	318	193	30	0	0	1202
	1956	0	0	0	0	157	354	364	318	203	77	0	0	1470
	1957	0	0	0	11	42	235	403	357	113	30	0	0	1191
5 year average		**0**	**0**	**0**	**16**	**98**	**303**	**389**	**349**	**189**	**57**	**0**	**0**	**1401**
Oklahoma City, Okla.	1953	0	0	17	29	220	510	465	442	315	127	5	0	2130
(Elev. 1280 ft)	1954	0	9	13	148	135	390	558	502	338	144	0	0	2237
	1955	0	0	18	101	240	301	504	442	338	70	5	0	2019
	1956	0	0	25	61	295	405	481	457	300	136	5	0	2165
	1957	0	5	0	73	184	368	527	457	218	73	0	0	1905
5 year average		**0**	**3**	**15**	**82**	**215**	**396**	**507**	**460**	**302**	**110**	**3**	**0**	**2092**
Ft. Smith, Ark.	1953	0	0	27	48	262	533	488	442	285	113	7	0	2205
(Elev. 458 ft)	1954	0	12	14	166	154	458	589	558	353	182	0	0	2486
	1955	0	0	45	151	318	360	558	349	375	113	48	0	2317
	1956	0	0	31	56	333	413	527	519	278	145	10	12	2324
	1957	6	6	5	114	282	435	574	488	285	87	12	8	2302
5 year average		**1**	**4**	**24**	**107**	**270**	**440**	**547**	**471**	**315**	**128**	**15**	**4**	**2326**

Region and City	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Memphis, Tenn. (Elev. 263 ft)	1953	7	0	48	51	314	563	519	457	278	99	8	0	2344
	1954	0	18	32	184	159	473	597	566	368	172	6	0	2575
	1955	0	0	66	152	318	330	543	504	360	120	52	6	2451
	1956	0	13	18	82	326	413	527	504	248	126	28	24	2309
	1957	13	16	9	168	302	443	496	450	285	79	19	11	2291
5 year average		**4**	**9**	**35**	**127**	**284**	**444**	**536**	**496**	**308**	**119**	**23**	**8**	**2393**
Nashville, Tenn. (Elev. 577 ft)	1953	0	0	13	51	295	473	465	426	240	83	6	0	2052
	1954	0	5	18	148	133	413	527	488	345	151	6	0	2234
	1955	0	13	46	113	271	270	527	481	330	77	16	0	2144
	1956	0	0	20	64	258	368	488	457	225	92	6	13	1991
	1957	7	7	0	160	253	413	465	403	285	41	15	0	2049
5 year average		**1**	**5**	**19**	**107**	**242**	**387**	**494**	**451**	**285**	**89**	**10**	**3**	**2093**
Knoxville, Tenn. (Elev. 950 ft)	1953	0	0	10	30	295	413	426	419	240	80	0	0	1913
	1954	0	0	19	128	120	368	488	450	330	136	0	0	2039
	1955	0	5	34	85	240	248	473	465	323	71	23	0	1967
	1956	0	0	23	50	241	335	419	411	210	90	7	17	1803
	1957	0	10	0	136	250	398	450	395	302	62	14	0	2017
5 year average		**0**	**3**	**17**	**86**	**229**	**352**	**451**	**428**	**281**	**88**	**9**	**3**	**1947**
MOUNTAIN AND THE SOUTHWEST														
Billings, Mont. (Elev. 3568 ft)	1953	0	0	0	0	0	100	240	202	68	0	0	0	610
	1954	0	0	0	0	22	66	295	171	42	0	0	0	596
	1955	0	0	0	0	15	76	246	256	63	15	0	0	671
	1956	0	0	0	0	56	178	240	168	48	0	0	0	690
	1957	0	0	0	0	18	78	263	194	46	7	0	0	606
5 year average		**0**	**0**	**0**	**0**	**22**	**100**	**257**	**198**	**53**	**4**	**0**	**0**	**634**
Casper, Wyo. (Elev. 5322 ft)	1953	0	0	0	0	0	84	223	155	40	0	0	0	502
	1954	0	0	0	0	14	67	302	155	50	0	0	0	588
	1955	0	0	0	0	0	42	202	202	39	0	0	0	485
	1956	0	0	0	0	9	87	147	75	24	0	0	0	342
	1957	0	0	0	0	0	37	186	172	10	0	0	0	405
5 year average		**0**	**0**	**0**	**0**	**5**	**63**	**212**	**152**	**33**	**0**	**0**	**0**	**465**
Reno, Nev. (Elev. 4397 ft)	1953	0	0	0	0	0	10	163	84	37	0	0	0	294
	1954	0	0	0	0	26	45	147	47	8	0	0	0	273
	1955	0	0	0	0	0	58	104	124	43	0	0	0	329
	1956	0	0	0	0	15	36	132	62	21	0	0	0	266
	1957	0	0	0	0	5	61	124	31	26	0	0	0	247
5 year average		**0**	**0**	**0**	**0**	**9**	**42**	**134**	**70**	**27**	**0**	**0**	**0**	**282**
Salt Lake City, Utah (Elev. 4260 ft)	1953	0	0	0	0	0	96	310	264	98	7	0	0	775
	1954	0	0	0	0	52	100	318	217	84	12	0	0	783
	1955	0	0	0	0	13	100	271	302	84	0	0	0	770
	1956	0	0	0	0	54	139	271	178	84	5	0	0	731
	1957	0	0	0	0	13	122	287	264	74	7	0	0	767
5 year average		**0**	**0**	**0**	**0**	**26**	**111**	**291**	**245**	**85**	**6**	**0**	**0**	**764**
Denver, Col. (Elev. 5292 ft)	1953	0	0	0	0	5	148	240	178	44	0	0	0	615
	1954	0	0	0	0	15	115	302	202	68	13	0	0	715
	1955	0	0	0	0	11	63	223	225	67	0	0	0	589
	1956	0	0	0	0	21	188	194	145	53	0	0	0	602
	1957	0	0	0	0	0	93	217	217	29	0	0	0	556
5 year average		**0**	**0**	**0**	**0**	**11**	**121**	**235**	**193**	**52**	**3**	**0**	**0**	**615**
Las Vegas, Nev. (Elev. 2162 ft)	1953	0	0	0	39	64	278	528	419	293	52	0	0	1673
	1954	0	0	0	77	257	308	519	411	273	102	0	0	1947
	1955	0	0	0	16	106	285	450	504	285	95	0	0	1741
	1956	0	0	5	31	163	338	457	380	323	68	0	0	1765
	1957	0	0	0	28	110	360	473	434	278	49	0	0	1732
5 year average		**0**	**0**	**1**	**38**	**140**	**314**	**485**	**430**	**290**	**73**	**0**	**0**	**1771**
Winslow, Ariz. (Elev. 4880 ft)	1953	0	0	0	0	15	128	318	240	98	0	0	0	799
	1954	0	0	0	0	30	185	326	256	165	36	0	0	998
	1955	0	0	0	0	6	88	256	295	113	20	0	0	778
	1956	0	0	0	7	34	180	287	209	135	7	0	0	859
	1957	0	0	0	0	0	165	279	271	158	10	0	0	883
5 year average		**0**	**0**	**0**	**1**	**17**	**149**	**293**	**254**	**134**	**15**	**0**	**0**	**863**
Albuquerque, N. Mex. (Elev. 5310 ft)	1953	0	0	0	0	52	255	349	287	135	0	0	0	1078
	1954	0	0	0	10	44	210	357	271	188	51	0	0	1131
	1955	0	0	0	0	31	150	287	302	165	24	0	0	959
	1956	0	0	0	0	54	270	287	248	173	34	0	0	1066
	1957	0	0	0	0	15	180	333	295	113	15	0	0	951
5 year average		**0**	**0**	**0**	**2**	**39**	**213**	**323**	**281**	**155**	**25**	**0**	**0**	**1038**

Region and City	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Yuma, Ariz.	1953	19	6	48	116	171	413	674	628	488	233	80	0	2876
(Elev. 199 ft)	1954	0	49	30	234	357	420	667	589	533	302	74	5	3260
	1955	0	11	29	75	240	413	581	667	511	357	48	12	2944
	1956	0	0	56	123	147	480	615	581	570	244	27	0	2843
	1957	7	81	61	150	233	488	659	628	503	248	26	8	3092
5 year average		**5**	**29**	**45**	**140**	**230**	**443**	**639**	**619**	**521**	**277**	**51**	**5**	**3004**
Phoenix, Ariz.	1953	0	0	52	95	147	413	628	581	398	178	46	0	2538
(Elev. 1114 ft)	1954	0	22	21	188	310	428	643	597	510	264	28	11	3022
	1955	0	0	27	72	248	413	543	589	420	279	28	0	2619
	1956	0	0	29	96	279	450	543	496	443	163	0	0	2499
	1957	14	54	32	104	225	473	620	574	428	240	16	0	2780
5 year average		**3**	**15**	**32**	**111**	**242**	**435**	**595**	**567**	**440**	**225**	**24**	**2**	**2691**
Tucson, Ariz.	1953	0	0	23	55	103	375	512	473	345	124	25	0	2035
(Elev. 2558 ft)	1954	0	0	0	113	209	338	519	450	390	186	16	0	2221
	1955	0	0	9	29	140	315	457	318	338	209	12	0	1827
	1956	0	0	8	41	225	420	465	434	390	197	0	0	2180
	1957	0	25	0	62	152	405	557	473	338	142	0	0	2154
5 year average		**0**	**5**	**8**	**60**	**166**	**371**	**502**	**430**	**360**	**172**	**11**	**0**	**2085**
El Paso, Texas	1953	0	0	15	31	94	375	450	403	248	61	0	0	1677
(Elev. 3920 ft)	1954	0	0	8	83	186	330	434	395	330	140	0	0	1906
	1955	0	0	0	37	140	308	395	395	285	88	0	0	1648
	1956	0	0	0	21	279	383	388	364	330	87	0	0	1852
	1957	0	10	0	16	110	330	442	403	240	64	0	0	1615
5 year average		**0**	**2**	**5**	**38**	**162**	**345**	**422**	**392**	**287**	**88**	**0**	**0**	**1741**
PACIFIC COASTAL AREA														
Seattle, Wash.	1953	0	0	0	0	10	0	65	93	50	8	0	0	226
(Elev. 386 ft)	1954	0	0	0	0	0	8	28	38	22	0	0	0	96
	1955	0	0	0	0	0	29	36	48	32	0	0	0	145
	1956	0	0	0	0	30	9	119	98	17	0	0	0	273
	1957	0	0	0	0	16	19	43	55	114	0	0	0	247
5 year average		**0**	**0**	**0**	**0**	**11**	**13**	**58**	**66**	**47**	**2**	**0**	**0**	**197**
Red Bluff, Calif.	1953	0	0	0	62	45	169	450	318	330	60	0	0	1434
(Elev. 341 ft)	1954	0	0	0	76	178	248	403	279	143	26	0	0	1353
	1955	0	0	6	0	131	240	318	391	233	83	17	0	1419
	1956	0	0	0	41	138	278	426	318	225	66	0	0	1492
	1957	0	0	0	39	106	323	372	302	248	0	0	0	1390
5 year average		**0**	**0**	**1**	**43**	**120**	**252**	**394**	**322**	**236**	**47**	**3**	**0**	**1418**
Sacramento, Calif.	1953	0	0	0	16	29	120	318	217	210	30	0	0	934
(Elev. 251 ft)	1954	0	0	0	74	87	158	287	186	128	52	0	0	972
	1955	0	0	6	0	94	150	217	249	188	53	0	0	957
	1956	0	0	0	20	85	203	264	217	188	62	0	0	1039
	1957	0	0	6	36	77	263	295	248	225	52	0	0	1202
5 year average		**0**	**0**	**2**	**29**	**74**	**179**	**276**	**223**	**188**	**50**	**0**	**0**	**1021**
San Francisco, Calif.	1953	0	0	0	0	0	11	16	63	98	13	0	0	201
(Elev. 1 ft)	1954	0	0	0	6	0	16	41	40	45	14	0	0	162
	1955	0	0	0	0	7	17	15	17	31	11	0	7	105
	1956	0	0	0	0	11	31	43	48	75	10	8	0	226
	1957	0	0	0	6	8	54	78	54	120	38	0	0	358
5 year average		**0**	**0**	**0**	**2**	**5**	**26**	**39**	**44**	**74**	**17**	**2**	**1**	**210**
Fresno, Calif.	1953	0	0	0	48	50	93	426	326	315	47	7	0	1312
(Elev. 331 ft)	1954	0	0	5	92	171	195	395	271	195	68	0	0	1392
	1955	0	0	10	0	110	218	296	354	240	82	0	0	1310
	1956	0	0	0	54	102	248	372	295	270	96	5	0	1442
	1957	0	5	13	39	90	300	364	287	263	49	0	0	1410
5 year average		**0**	**1**	**6**	**47**	**105**	**211**	**371**	**307**	**257**	**68**	**2**	**0**	**1375**
Bakersfield, Calif.	1953	0	0	13	58	63	203	450	349	338	76	34	0	1584
(Elev. 489 ft)	1954	0	5	12	122	209	255	450	318	248	99	9	0	1727
	1955	0	0	14	7	147	263	341	434	293	124	9	5	1637
	1956	0	0	14	74	183	300	427	349	308	108	9	0	1772
	1957	0	14	20	55	148	368	434	357	315	102	0	0	1813
5 year average		**0**	**4**	**15**	**63**	**150**	**278**	**420**	**361**	**300**	**102**	**12**	**1**	**1706**
Los Angeles, Calif.	1953	0	11	0	0	31	113	256	194	135	109	49	0	898
(Elev. 99 ft)	1954	0	18	0	12	40	135	287	248	188	72	28	0	1028
	1955	0	0	6	9	20	98	171	256	218	32	24	0	834
	1956	0	0	9	11	46	203	202	235	218	109	42	0	1075
	1957	0	23	17	8	72	210	287	301	210	155	12	0	1295
5 year average		**0**	**10**	**6**	**8**	**42**	**152**	**241**	**247**	**194**	**95**	**31**	**0**	**1026**

Air Leakage Due to Stack Effect in Multi-story Buildings

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Forces that bring about stack effect in multi-story buildings are explained and suggestions presented for reducing air leakage. Stack effect makes the operation of doors difficult and interferes with the operation of dampers.

AIR leakage into a building is due primarily to stack effect and this in turn is influenced by structure height and the difference between inside and outside building temperatures. In winter, the cold air outside is dense and consequently heavier than inside air. This heavier air tends to displace the lighter building air by forcing its way in at the bottom of the building and pushing the warmer air out the top. In the summer, since the column of air within the air conditioned building is colder and more dense than the outside air, air currents are in reverse and travel down in the building.

Graphic Presentation

Expressing the effect graphically, it can be seen in Fig. 1 that the weights of columns w_1 and w_2 are equal since they are equal in temperature and consequently equal in density. The column of air within the building, w_4, however, is warmer and lighter than w_3, the adjacent air outside. Totaling the weights in each column, it is apparent w_1 plus w_3 is heavier than w_2 plus w_4, hence pressure P_1 is greater than P_2.

Mathematically, the pressure at the bottom of each column is:

$$P = (\mathrm{h} \times \mathrm{d})/144$$

Where:

P = pressure, psi
h = height of building, ft
d = density of air column, lb per cu ft

The pressure difference $(P_1 - P_2)$ would indicate the net pressure creating the stack effect.

As an example, the Chase Manhattan Bank Building, New York City, now under construction, will have an overall height of 770 ft. It will have a theoretical stack draft of 1.9 inches of water when the building is heated to 70 deg F and the outdoor temperature is 0 deg, neglecting the influence of any exterior forces.

It is this basic physical law which dictates that cold winter air will seek to enter a warm building through entrance lobbies and lower floors, travel up elevator shafts, stairways and mail chutes and relieve out through upper floor openings.

This tendency for air to enter building lobbies manifests itself in two ways: (1) a reduced ground floor temperature which requires excessive quantities of heat to maintain comfortable conditions and (2) a pressure difference across the entrance which makes it difficult to open a hinged door.

Determining Air Leakage

Several consulting engineers were questioned in an attempt to arrive at some precise means of determining how much heat is required to offset air leakage into a lobby and at what building height the pressure difference created makes it necessary to use revolving rather than hinged doors. These engineers all stated that their basis for design is practical experience and past practices on similar type structures.

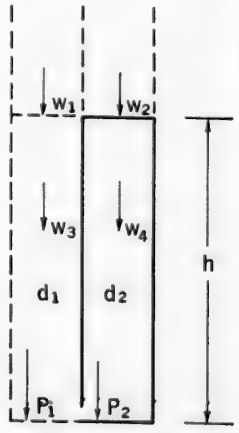

Fig. 1. Graphical presentation to show movement of columns of air due to temperature and density.

Upon consulting the American Society of Heating and Air Conditioning Engineers Guide for more definite information, the following formula expressing building stack effect was found.

$$Q = 9.4A\sqrt{h(t_1 - t_0)}$$

where:

Q = air flow, cfm
A = free area of inlet or outlet openings, sq ft
h = height from inlets to outlets, ft
t_1 = average temperature of indoor air in height h, Fahrenheit
t_0 = outdoor temp., Fahrenheit
9.4 = constant including value of 65% opening effectiveness

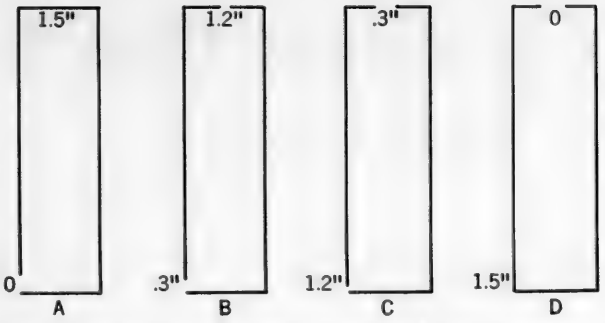

Fig. 2. Sketches to show the location of built-up pressure, due to the location of building openings.

As an example the Chase Manhattan Bank building, with a height of 770 ft, a 0 deg outside temperature, 70 deg inside temperature and 20 sq ft of opening top and bottom, will create an air current into and up through the building of 44,000 cfm.

External Forces Affecting Stack Effect

Since the stack effect is due to a greater pressure outside and at the bottom of a building than exists inside the building, it is readily understood that any condition increasing the interior pressure or any constriction of the bottom and top building openings will, in turn, reduce the flow of air up through the building and out the top. Most modern buildings are under some interior positive pressure due to the mechanical ventilation systems supplying more air than is exhausted. Although the Guide states that positive pressures from ventilation systems have an important influence on stack effect, the formula does not take that into consideration and therefore it should not be used for ventilated buildings. The formula does reflect size of openings, however, and here we have the single most important factor on stack effect, since it not only determines the amount of infiltration, but, depending on the location of these openings, produces the point of pressure differences. This is best illustrated by Fig. 2.

If the building is completely sealed at the top, *A* of Fig. 2, and has openings at the bottom, the entire pressure, due to stack effect, is felt at the top. Since air cannot relieve out the top, no additional air would enter at the bottom and the pressure difference across the entrance doors would be nil.

Sketch *D* reverses the condition of *A* and for a building with a stack draft of 1.5 inches of water, the entire pressure would be exerted at the lobby doors. This calls for an opening at the top as shown.

Sketch *B* indicates a small opening at the top and a much larger opening at the bottom with a consequent greater pressure at the top of the building.

Sketch *C* reverses *B* with a resultant shifting in the point of greater pressure.

To illustrate the magnitude of this pressure on doors, should one attempt to open a hinged door with a pressure of 1.5 inches of water exerted against it the pull required would be the same as that necessary to lift a horizontal weightless door covered with a layer of water 1.5 inches deep.

Stack Effects

To observe the stack draft first-hand, we inspected first a sealed or fixed sash type building, and a non-sealed type.

With both doors of a double door vestibule open in the non-sealed building, and a 30 deg outdoor temperature, an anemotherm (an instrument sensitive to air velocities), registered a reading of 1000 fpm. This is equivalent to an 11.5 mph wind into the lobby.

A shaft which opens into the mechanical equipment room on the 33rd floor was checked next. Air was pouring into the room at the rate of 1100 fpm, and an investigation revealed that air was being relieved from the area through open doors to the cooling tower section and the fire tower. Closing these doors reduced the inlet velocity to 600 fpm, which indicates less upward draft as the top building openings are restricted. The velocity could not be reduced further since there were several pipes up to 16-inch dia through the wall to the cooling tower section with 2-inch clearance around each, in addition to leakage at doors and windows.

Another door, as well as the one mentioned, was found open to the fire tower with a velocity of 1000 fpm across it. It was observed that the door's self-closer could not overcome the opposing pressure due to the stack effect.

An inspection of the elevator machine room indicated a velocity of 700 fpm across each of the shaft smoke holes and 1500 fpm through a window open to the outdoors.

Sealed Type Buildings

Proceeding to the sealed type of building, we found a velocity of 1600 fpm across the entrance doors when opened, which caused foliage of plants in the lobby, 35 feet from the door to sway in the breeze.

The elevator smoke hole velocity in the 46th floor machine room was 1600 fpm, and upon opening a door to the adjacent equipment room, the velocity increased to 2100 fpm, indicating the effect of openings on stack draft.

We observed that the exhaust system in this room, in the form of two 48-inch axial flow fans was shut down. The chief engineer of the building informed us that there was sufficient ventilation with the fans off and that motorized dampers had to be installed at the fan discharges to prevent the fans spinning at a tremendous rate although shut off. In this case, the stack effect created a pressurized condition within the room which was relieved through the fans to the outdoors.

Our inspection showed that a considerable amount of air was leaking into a mechanical equipment room at the top level and we checked to determine how this air was in turn transmitted to the outdoors. We found an open door to the outdoor cooling towers, and the automatic dampers in duct discharges from an indoor cooling tower and exhaust air fan were both stuck open, although the fans were off. This served to indicate how difficult it was to attempt to seal the openings in a building.

Another effect, observed at the entrance to the penthouse club, was the constant moan of the air crowding out through the cracks around the elevator and the fire tower doors, creating weird and annoying sounds.

Descending to the 27th floor elevator machine room, we determined the smoke hole velocity had decreased to 1000 fpm, indicating the stack effect is a function of height.

The part that a positive pressure developed by the

ventilating system plays in the overall effect was seen when a 2nd floor door to an interior fire tower was opened. The air was forced into the tower due to the stack effect plus the positive pressure within the building and the velocity registered was 3600 fpm. It took all of the writer's strength to close the door once the door had been opened.

All these effects were observed while the outdoor temperature was 30 deg. During colder weather, the stack effect, which is proportional to the temperature difference, will increase accordingly.

Another building condition was observed that the building engineer referred to as "building settlement". Cracks developed in the core walls adjacent to elevator shafts and stairwells which permitted air to leak through from the hung ceilings. Although these cracks are ¼ inch wide, when multiplied by the number of feet per floor and the number of floors, the effective opening with the resulting leakage becomes considerable.

A similar effect was observed at a 20-story building on Madison Avenue when the building there was completed. A large retail store occupied the ground floor and in cold weather, the amount of air infiltration through the single row of doors was a continual cause for complaint. It was finally determined that the hung ceiling, which was used as a return air plenum for the air conditioning system, was leaking its air through masonry wall cracks into the elevator shafts. When the cracks were pointed and the entire wall sprayed with a plastic compound, the infiltration was reduced to a bearable level.

Conclusions and Recommendations

To summarize, the stack effect in buildings is a function of the height and temperature difference between indoors and outdoors.

The created draft, is in turn, affected by certain external conditions, primarily: Size and locations of openings and pressures exerted on the draft.

In the category of openings, the following conclusions can be drawn:

1. Cracks around doors to lobbies, elevators, stairwells and fire towers, should be sealed as much as possible by some means of weatherstripping.
2. Lobby entrances, especially in tall buildings, should be equipped with revolving doors.
3. Retail shops incorporated in buildings should be studied carefully for proper control of openings between the shop and an adjacent lobby which could be another path for air infiltration.
4. All openings for mechanical equipment such as fresh, exhaust and relief air louvers should be equipped with motorized dampers having neoprene edges so that positive shut-down with minimum leakage can be achieved. Any other openings made to accommodate mechanical work, such as clearance around piping in wall and floor should be effectively plugged to reduce air flow.
5. Care should be taken in the construction of core walls to eliminate the possibility of excessive cracking and consequent leakage.
6. Careful consideration should be given to the selection of door self-closers for stairwells and fire towers to insure that they can function and close against stack pressure.

G. L. Smith attended New York University and studied heating and air conditioning under the late Dean Mario Gianinni, completing his studies in 1941. He has worked for several consultants such as Meyer, Strong and Jones and Lockwood Greene. After three years of Army service in airborne radar, he worked for the J. C. Penney Company from 1947-1951 as assistant chief engineer in charge of heating and air conditioning design for the chain's stores. Since 1951, he has been with Skidmore, Owings & Merrill as chief mechanical engineer for the New York office. He has been in charge of mechanical design for such projects as the Hilton Hotel in Istanbul, Morocco air bases, Hoffman Beverages and Pepsi-Cola plants and acted as coordinator with several of his office's mechanical consultants. Mr. Smith is a professional engineer licensed in New York.

In regard to pressures influencing draft, the following important points can be made:

1. A positive pressure developed within a building will effectively reduce the amount of infiltration. Consequently, the mechanical ventilation system should introduce a decidedly greater quantity of fresh air into the building in comparison to the amount of air exhausted.
2. Since stack pressures will be developed in elevator machine rooms through the shaft smoke holes, the design of their ventilating systems should take this into consideration. A fan supplying air to the machine room and connected to the outdoors should be capable of developing the required system pressure losses plus the stack pressure. An exhaust fan, on the other hand, should be selected on the basis of the stack pressure acting in concert with the fan's developed pressure. In many cases, an exhaust fan for upper floor ventilation is not necessary since the stack pressure could provide for the proper quantity of exhaust air through controlled openings to the outdoors.
3. A possible solution is the installation of a pressuretrol in the elevator machine room which would modulate motorized dampers in louvered openings to the outdoors, in accordance with the stack pressure developed. This arrangement would utilize the stack effect as the pressure required for the proper exhaust of air. As the outdoor temperature increased and the stack pressure fell off, the machine room temperature would tend to climb due to improper ventilation. A room thermostat would automatically start the exhaust fan and possibly a supply air system through an electric interlock.
4. Although the stack effect in multi-story buildings is the single most important cause for air infiltration, it is well to mention that wind pressure too, plays a part in the overall picture.
5. Across entrance doorways, the effect of wind pressure would be added to the stack effect causing an increase in air infiltration. In the upper floors of tall buildings, there would be some air infiltration on the windward side of a building and an equal quantity of air exfiltrating on the leeward side.

These factors can be controlled to a great extent by shielding building entrances from the prevailing winds and the upper floor condition can be corrected by carefully sealing the skin of the building.

Methods and Systems Used for

Temperature Measurement

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A discussion of what is known about temperature and the various systems of temperature measurement now being used. Each system has a specific temperature range.

ONE can hardly go through a single day without being affected by or being concerned with temperature or changes in temperature. Persons dealing with technical problems are seriously concerned with temperature, for to them it becomes a variable item of the utmost importance.

Even though temperature is such a widely used quantity, it is not often defined clearly. A clear definition is a necessity for understanding its meaning and implications and lacking this, temperature is often poorly measured or a reading is wrongly interpreted.

Temperature is presently defined as the measure of the energy (mostly kinetic) of molecules. This definition in itself points to the great difficulties encountered when trying to measure temperature without disturbing the molecules.

Measurement of Temperature

It is necessary to determine the energy of molecules to find the temperature. This is an extremely difficult task since the molecules, if disturbed, will change their energy and the reading obtained will not reflect the true picture. When a surface temperature is desired, it is necessary to measure the energy of the surface layer of molecules without disturbing the molecules.

While the molecular energy can be determined either directly or indirectly, an indirect measurement is in most cases easier to obtain. A gas will change its pressure or its volume. A bar will change its length. A substance may change its electrical characteristics or its color with a change in molecular activity. Any of these changes can be used as an indication of temperature.

Molecular Activity

Unfortunately, all substances react differently to this change in molecular activity. If, for instance, a copper and a tungsten bar are taken and submerged in an ice-water mixture, their respective length can be measured to indicate the freezing point. When they are submerged in water boiling at atmospheric pressure and their respective elongations measured, the boiling point is indicated. If the change in length of each bar is divided into 100 divisions, each can be used as a temperature division or degree. We now have two arbitrary temperature scales, a copper and a tungsten scale which agree at freezing and boiling points. If these bars are now submerged in a water bath which makes the copper scale read 50, the tungsten scale will read 54.

Since different results are obtained with different materials, it is necessary to take a particular system as *standard* and calibrate all other systems in terms of this standard. Such a standard was decided upon internationally, giving definite values to easily reproducible points (ice-water mixture and boiling point at standard atmospheric pressure, the melting points of silver and gold, etc.). These fixed points can then be expressed on different scales, such as Fahrenheit, Centigrade, Kalvin, Rankine, etc.

Standard System

Rather than calibrate each substance, it is more convenient to take a particular system, calibrate it and then bring it into equilibrium with the temperature of the substance to be measured. This system is then a thermometer, but this does not necessarily mean a glass thermometer.

From the original definition of temperature, one can see that it is impossible to do this without disturbing the energy of the molecules of the substance to be investigated. Energy will always be exchanged between the molecules of the substance to be measured and the molecules of the thermometer until all of them are at the same energy level. If, however, the number of substance molecules exceeds tremendously the number of thermometer molecules, the average disturbance to the substance molecules will be small and the temperature reading obtained will be very good. Naturally, the thermometer molecules should not be affected by other energy sources such as other molecules, work, heat by conduction or radiation, friction and electrochemical processes, which would make the reaching of equilibrium impossible.

Determining Temperatures and Errors

It is now clear that the measurement of temperature is an extremely difficult problem, since the requirements for the exact temperature determination cannot be met but only approximated in practice.

Among others, the indicators listed on Table I can and have been used as temperature indicators.

Each of these methods or devices will have its application within certain temperature ranges and will give satisfactory results when used correctly. This requires:

1. That the readings of the thermometer are always the same for otherwise reproduced conditions.

2. That the particular thermometer used was previously calibrated by an accepted standard.

3. That the thermometer be brought into equilibrium with the substance the temperature of which is to be

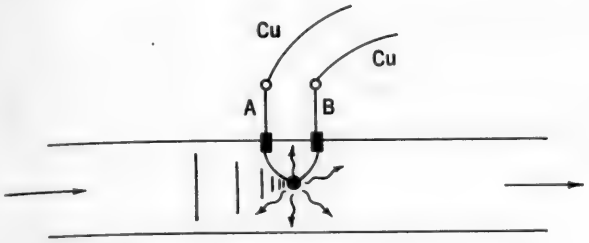


Fig. 1. Temperature measurement in a pipe.

measured without disturbing this substance.

4. That the thermometer cannot be affected by anything except the substance under investigation. (This excludes heat transfer to or from the thermometer due to outside sources, friction work done on the thermometer, forces or stresses applied).

Since these conditions cannot be met exactly, every temperature measurement will be an approximation, its degree depending upon how well these conditions are met. Errors in the readings of temperature are due to nonconformity with these conditions, but a good understanding of the principles involved will either allow a reduction of these errors or, if this is not possible, will allow a correction of the reading to lead to the true temperature.

In Figure 1, the use of a thermocouple to measure the temperature in a pipe demonstrates four errors often introduced into temperature measurement.

Let us say hot fluid, a gas, is flowing in the pipe. The problem can be analyzed according to the requirements set up for accurate temperature measurements:

Condition 1. Thermocouple wire materials have been selected which give good reproducibility but the lead wires, Cu in Fig. 1, attached to the thermocouple wires *A* and *B* form junctions (also at the instrument terminals) which may generate EMFs and, if at different temperatures, make the reading obtained uncertain. Errors in excess of 600 deg have been observed when some of the intermediate connections were sliding contacts (producing heat by friction) as is necessary when measuring temperatures on moving or rotating components. Having all junctions except the hot and cold junction at the same temperature, (if this can be done) will essentially eliminate this difficulty.

Condition 2. This condition could only partially be satisfied since it was most likely impossible to calibrate the thermocouple against a standard in the set-up as actually used; this calibration could be done when removed from the pipe.

Condition 3. This condition was not satisfied since the thermometer stops the fluid in front of it (compressing it) which is indicated by a rise in temperature reading. This error may be a fraction of a degree to about 26,000 deg for a missile that is re-entering the earth atmosphere.

Condition 4. The thermocouple loses energy to the walls by radiation and conduction, which will tend to make the thermocouple read low.

The above examples demonstrate commonly found errors of every day temperature determination; all of them present here in a single measurement.

TABLE I—TEMPERATURE INDICATORS

System	Approx. Range, Deg F
Thermodynamic properties	no limit
Speed of sound	no limit
Gas thermometers (pressure or volume)	—453 to 2900
Mercury in glass thermometers	— 44 to 660
Alcohol in glass thermometers	—112 to 212
Bimetallic strip thermometers	— 48 to 950
Thermocouples	—420 to 3250
Resistance thermometers	—458 to 3250
Optical Pyrometers	1100 and up
Total radiation pyrometers	200 and up

Widely Used Temperature Measuring Systems

Having discussed the general principles involved in temperature measuring devices which apply to all the systems, a few specific thermometers will be considered in detail.

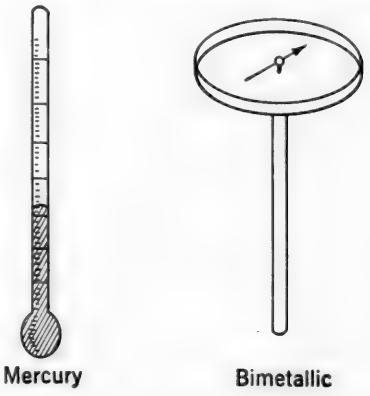


Fig. 2. Two types of thermometers in common use.

Mercury or Alcohol in Glass Thermometers. Thermometers of this kind, Fig. 2, are very convenient for many applications but are rather fragile and cannot be used under severe operating conditions. These thermometers are usually a capillary attached to a glass bulb and the combination partially filled with liquid. The space above the liquid is evacuated or filled with an inert gas and then permanently sealed. This thermometer is calibrated against a standard, either completely submerged or partially submerged. In the latter

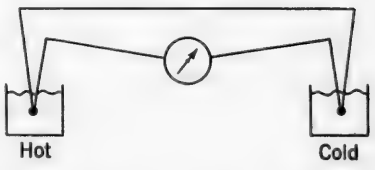


Fig. 3. Use of a thermocouple.

case, the section of submergence must be marked. To obtain good results, the thermometer has to be used in the same manner as calibrated or a correction must be made.

Thermometers when used correctly may have to be shielded from sources of radiation, and corrections made for disturbing the medium (as compression of a moving fluid). To obtain reproducibility, often hours are required for the glass to take up its original volume.

Bimetallic Strip Thermometers. This type thermometer, Fig. 2, is used where ruggedness is a primary consideration and the direct reading quality is advantageous. These thermometers come in many varieties with the differential expansion between two metals being the means of turning a pointer. Often, it closes a contact as in thermostats.

Industrial Use

Thermocouples. Figure 3 shows a thermocouple, the most widely used temperature indicating device in industry. It is not direct reading as a thermometer but produces an EMF which is a function of temperature. Dissimilar materials, when joined properly, will produce an EMF (electromotive force) which can be measured either directly by balancing or opposing it with a voltage from a battery, or indirectly, by measuring the current that is produced in a given circuit. The first method requires a potentiometer to oppose the EMF and the reading is taken when no current flows in the circuit. Thus, the length of the leads from the junctions to the instrument is immaterial since the resistance has no effect upon the reading. In the second case, where the current which is produced by the EMF is measured by an accurate milliameter, the resistance of the circuit has to be taken into account, also, the length of the leads considered.

Junctions can be designed to do a particular job; to give good response to varying temperatures, to give an average reading over a temperature gradient or to give almost a point reading.

In all uses of thermocouples the intermediate junctions have to be carefully controlled so that they do not alter the reading which is taken as the temperature.

Each thermocouple should be calibrated against a

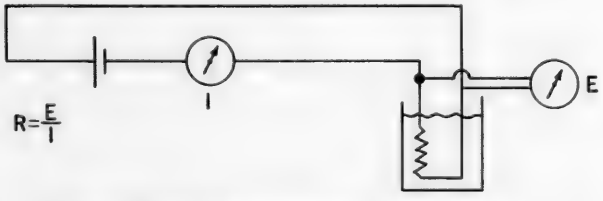


Fig. 4. Circuit for a resistance thermometer.

standard since the thermocouple materials and the method of joining them will determine the EMF produced. If calibration of every thermocouple is not possible, then all thermocouples should at least be taken from the same batch or spool and then joined and attached by the same method (soldered, flame welded or spot welded). Chemical reactions (as oxidation and electrochemical processes) will also affect the EMF, therefore must be prevented.

Overlooking any of these factors, or indiscriminate use of thermocouples, will only introduce errors and produce discouraging results.

Resistance Thermometers. Figure 4 shows a simple circuit in which the resistance element can be used as a thermometer if the material from which it is made varies its resistance markedly with temperature. From the voltage E across and the current I through this element, the resistance R can then be determined as well as the temperature.

Fig. 5. View as seen through an optical pyrometer.

Optical Pyrometers. In the incandescent range of temperature measurements a pyrometer, especially the optical pyrometer, is often used. It matches the brightness of the object with a precalibrated brightness of an electrically heated wire, Fig. 5. At the correct adjustment, the glowing wire disappears against the red colored background. With practice, very good reproducibility can be obtained.

Additional Systems

Other Methods. Many other methods besides those mentioned earlier are available, such as pyrometric cones having definite melting points and paints or coatings which change color with temperature. Materials themselves may permanently change color indicating the maximum temperature to which they were heated (turbine blades and internal combustion engine valves).

The particular physical property used to indicate the desired temperature or temperature change is left entirely to the experimenter or observer. How well he will be able to determine this will depend only upon his ingenuity and the understanding of the various principles involved.

Summary

It is well to repeat again that the determination of temperature, a very common problem, is one of utmost difficulty. It requires, due to the nature of temperature, that certain things be done which at best can only be approximated:

1. The thermometer has to give reproducible readings, requiring among other things, reasonably short recovery time. (Even for glass thermometers, that may take hours).
2. It is always necessary to obtain a thermometer which has been calibrated against an accepted standard or, if that has not been done, to calibrate the system.
3. The thermometer has to be brought into equilibrium with the substance the temperature of which is to be measured without disturbing that substance.
4. The thermometer must not be affected by other bodies, molecules or energy sources during the measurement.

If, for any temperature measuring system, these conditions are closely satisfied or if deviations are corrected, satisfactory results can usually be obtained.

NDHA Meets at French Lick, Ind.

A. F. METZGER
Supervisor of Steam Utilization, Allegheny County Steam Heating Company, Pittsburgh, Pa.

Abstracts of some of the important papers presented at the annual convention of the National District Heating Association. W. G. Gillin elected president with J. F. Collins, Jr., re-elected Secretary-treasurer.

THE National District Heating Association held its 49th Annual Meeting at the French Lick-Sheraton Hotel at French Lick, Ind., June 2-5, with the first day devoted to technical committee and executive board meetings.

New officers elected are: W. G. Gillin, president; G. F. Prestwich, 1st vice president; A. F. Metgzer, 2nd vice president; J. D. Lemon, 3rd vice president; J. F. Collins, Jr., secretary-treasurer; F. W. Deutsch, director; C. W. Signor, director and F. C. Meyer, director.

Many interesting papers were presented during the five technical sessions and a few of the more interesting ones are summarized.

Locating Leaks

Dr. S. F. Whirl, Duquesne Light Co., Pittsburgh, Pa., spoke on Methods for Detecting and Locating Leaks in Buried Condensate Return Lines. From a search of available literature for methods of detecting leaks used by other pipe line industries, two methods were found which might be feasible for underground condensate return lines. These methods were a water column test and a radioactive isotope test.

A questionnaire sent to all member steam companies indicated that the "prospecting" method is the one most widely used. However, one member company described another method which shows promise of being a good one. This method is called the air pressure method.

Brief descriptions of the three most likely methods are as follows:

Water Column Method. To use this method, the slope of the underground pipe must be known. A vertical glass tube must then be attached to the lower end of the section of pipe in which the leak is known to exist and which has been isolated from the remainder of the piping system. The isolated pipe is then filled with water and the column of water in the glass tube shows the elevation of the water in the pipe. As the water passes out through the leak, the column will drop until the water level reaches the leak. At this, the water column will become stationary. By reading the water column, the elevation of the leak can be determined and by correlating this with the line slope, the approximate location of the leak can be found.

Radioactive Isotope Method. In this method a quantity of radioactive isotope such as iodine 131 or sodium 24 is introduced under pressure into the isolated leaky section of underground pipe. Some of the radioactive material will contaminate the soil at the point of leakage. The pipe is then thoroughly flushed out with water to remove the radioactive material. However, the material which passed into the soil cannot be removed. This will permit the area of leakage to be detected with a geiger counter.

Air Pressure Method. In this method both ends of the leaky section of pipe must be opened and a hose snaked through. A rubber bladder is attached to one end of the pipe and inflated by a hand pump on the other end of the hose. This provides an air tight barrier which can be positioned at any point along the entire length of the pipe by withdrawing the hose. As soon as the bladder is drawn into the pipe, that end of the pipe is closed and an air pressure created in the pipe between the closed end and the bladder. This pressure is indicated on a gage at the end of the pipe. If there is no leakage in the pipe, the air pressure can be maintained without make-up. The bladder is then deflated, moved a few feet and reinflated and the air pressure reestablished. This is repeated until it is evident that the air is escaping at the leak. Its location is determined by the length of hose between the bladder and the open end of the pipe.

Corrosion Studies

A paper on The Use of Rotogenerative Corrosion Current Detection in Corrosion Studies was presented by J. K. Rice, Cyrus Wm. Rice & Co., Pittsburgh, Pa. There are many methods for studying corrosion but the one published by H. T. Francis and the author several years ago appears to have advantages that the others do not have. One of the most useful features of this system is that it enables one to follow the progress of corrosion of a specimen without removing it from the corrosive medium and without appreciably affecting the corrosive action taking place.

When a metal undergoes corrosion in a dilute solution of an electrolyte, the action that takes place is that of countless local cells on the surface of the metal. Each local cell generates a small corrosion current on the electrolyte adjacent to the cell which in turn results in ohmic potentials in the electrolyte layer in the vicinity of the corrosion cells. The measurement of these currents and potentials is employed in the test method described.

To study corrosion by this method, it is necessary to measure the potential output of all cells in some selected area on the surface of the specimen metal. The author accomplished this by using a metal specimen in the shape of a ¼ inch diameter rod 3-inch long. One end of the rod is immersed in the desired electrolyte and the other end is fastened to a rotating drive mechanism. The specimen is then rotated on a vertical axis with the bottom end immersed. A probe made of a glass tube drawn out into a fine capillary and filled with a saturated

KCl agar solution is so shaped that the end of the capillary is positioned within a very short distance of the submerged surface of the metal specimen. At the other end of the probe tube, which bends up and out of the electrolyte and also filled with KCl solution, there is a mercury calomel cell. Electric leads from the probe and the specimen metal run to an oscilloscope.

When the specimen is rapidly rotated, the probe picks off the potentials of one circumference band of the specimen. By the use of a timing device, one rotation of the specimen results in one full sweep of the X-axis of the cathode ray tube. With the proper calibration, the cathode ray tube will present a graph showing the potential for each point on the circumference of the rotating specimen.

By changing the character of the electrolyte, by adding corrosion inhibitors, the effect on corrosion can be studied without disturbing the specimen. The same equipment can be used for many kinds of corrosion studies.

Temperature Control

In the paper, Temperature Control Installations in Boston, by Frank C. Meyer, Boston Edison Company, the author explained the policy of his company in renting automatic temperature control devices to their steam customers. The practice started during the depression in the 30's and proved so satisfactory that it is still in use today. The Edison Company does not promote the use of this service by customers owning large buildings, which are adequately staffed with personnel qualified to intelligently operate control equipment. It is used mostly in apartment buildings, and older small and medium-sized commercial buildings.

Rental controls are limited to three models of intermittent controls actuated by outside temperature except in the case of very small buildings where day and night room thermostats are used.

In Boston, steam is distributed at pressures in excess of 100 psi and is made available to the customer at 40 psi through a company owned pressure regulating valve. Because the main line pressure may approach 200 psi, the customer is required to install a second 250-lb construction pressure regulating valve of the single seat, dead end service, regulating pilot type. This valve is used as an automatic shut-off valve by installing a solenoid valve in the pilot piping. The solenoid is actuated by the heating control.

With this type of valve, two-pipe heating systems can be made into modulating systems by providing 3-lb orifices at the radiator inlets and installing two pressure pilot valves and two solenoid valves on the customer's regulating valve. With a two-bulb control, the bulb set to maintain a slightly higher temperature than the other operates the pressure pilot set for 6 to 8 ounces and the other bulb operates the 3 psi pressure pilot. During the morning pick-up, the system will operate on 3 psi. After pick-up, when the temperature is below 40 deg F, the pressure will vary between ounces and 3 psi with the radiators emitting from 25% to 100% of their rated capacity. In cold weather, steam is supplied continuously. When the temperature is above 40 deg, the system will operate intermittently between ounces and off. Temperature regulation and efficiency with this system are better than with the usual intermittent system.

Heating Railroad Cars

The Union Depot in Detroit is located on the edge of the downtown business district. When the Depot Company was approached by the Detroit Edison Company in 1949 regarding the use of district steam, only 18 psi pressure was available from the street main and the Depot Company insisted they needed 100 psi for car heating. A contractor's bid for the necessary piping changes including a steam compressor for the steam for the car heating was too high for the prospective customer. All of this is covered in a paper on Heating Railroad and Pullman Cars in Detroit, by Carl B. Sprenger, Detroit Edison Company.

In 1955 negotiations were again opened. This time 30 psi steam was available, but the Depot Company was skeptical about the ability of 30-psi steam to heat the cars. To clear up this doubt, the Edison Company installed a pressure regulating valve in the car heating steam line which was supplied from the depot 100-psi boilers, and reduced the pressure from 100 psi to around 21 to 27 psi and successfully heated strings of cars ranging from 5 to 10 cars per string. The pressure drop was found to be about 2 pounds per car.

On the basis of these tests, the Depot Company contracted for steam service in December, 1956.

Since the service has been in operation, the cars have been successfully heated with 30 psi steam. The average annual steam consumption was found to be 144 lb per car and the peak demand per car hour is 200 pounds.

Motel Heating

Another paper by Carl Sprenger covered Motel Heating. In the past two years, 25 motels have been built in or near the downtown area of the City of Detroit. Three of these now use district steam service. A 125-unit motel being built will be cooled as well as heated by district steam. An absorption refrigeration machine will be used. One of the three already using district steam uses a steam absorption water chiller for air conditioning.

Two of the present district steam heated motels use Select-Temp self contained heating units which include a heating coil, a steam turbine driven blower, and a modulating thermostat. They are connected by $\frac{3}{8}$-inch copper steam supply tubing and the return connections are $\frac{1}{4}$ inch copper tubing. The mains are also copper tubing. The pipe joints are silver soldered.

Some performance data obtained from a 65-unit motel with office and coffee shop are as follows:

203 lb steam per degree day
1.34 lb steam per degree day per M. cubic feet of space
3.12 lb steam per degree day per rental unit.

The consumption was 33% less than the Edison Company's estimate.

At another 45-unit motel the data were found to be:

175 lb steam per degree day
1.36 lb steam per degree day per M. cubic feet
3.89 lb steam per degree day per unit
642 lb steam per degree day for process
14.5 lb steam per degree day per unit for process steam.

The consumption in this case was 27% below the estimate.

Uses of Teflon

A paper on Uses of Teflon in Steam Equipment Main-

tenance was prepared by Charles C. Brown, Consolidated Edison Company of New York. Teflon is a registered trade mark for tetrafluoroethylene manufactured by E. I. DuPont in a powder form. It is converted by licensed manufacturers into tape, sheets, rods, tubes and other forms. From these basic shapes, packings and valve seats are machined or cut.

The New York Steam Company has a large number of St. Johns steam meters in which various substances were tried as seats for the packless spindles which required a great amount of maintenance. An article in a technical magazine led to trying Teflon. It proved so successful it was accepted in August, 1950 as the standard material for this purpose.

It was also found to be superior for packing pressure reducing valves in 1953.

In 1956 it was tried as discs in ¼" angle and globe valves which are used as test valves on various equipment. It is now used for valve packing on the distribution system valves.

Because of its much longer wearing ability, it has saved the New York Steam Corporation many hours of maintenance time. The material is very expensive but it is claimed that its performance more than justifies its added cost by reduction in maintenance expense.

Cooling Degree Days

Development of a System of Cooling Degree Days by John J. Drummond, Consolidated Edison Company of New York, discussed a method of measuring the way in which energy requirements for air conditioning vary. Even ten years ago the amount of air conditioning load on New York's electric system had grown to the point where temperature fluctuations were causing week to week variations in electric output of about ten million kilowatt hours. With such variations in load due to outside temperature, it is apparent why some system of correlation is desirable.

In New York, electric output was compared to wet bulb temperature because this temperature would reflect the changes in relative humidity. While this gave a fairly consistent pattern, some points on a graph comparing daily output to average wet bulb temperature fell out of line. When output was compared to an average of daily wet bulb and dry bulb temperatures, the points came closer to the graph.

A similar graph was presented showing the relationship of steam output to average wet bulb and average wet and dry bulb temperature. Here again the wet and dry bulb averages showed the best correlation.

These graphs, prepared from June, 1957 data, indicated a flattening out at 55 deg. Further investigation showed that this temperature pertained primarily to load loss after a warm spell. After a cool spell, load increase might not start until about 60 deg. This indicated a base temperature of 57.5 deg average wet and dry bulb on which to compute cooling degree days.

The normal cooling degree days for New York City, computed on a base of 57.5 deg using average daily wet and dry bulb temperatures over a period of 30 years (1921 to 1950) was determined to be 1364 per cooling season.

This system of cooling degree days was helpful to the Consolidated Edison Company and other utility companies who have tried it in estimating steam sendout. It cannot be used in estimating steam usage of individual buildings because of their differing construction and operating characteristics and because air conditioning has not settled down to a fixed pattern to the same extent as heating.

Steam Main Protection

James A. Sheppard, Jr., Consolidated Edison Company of New York, presented a paper on Cathodic Protection of Underground Steam Mains.

In the installation of an underground steam main in a protective structure of steel, electric potential differences between the steel structure and the earth will exist, causing a current to flow and corrosion to take place. Corrosion can be controlled by keeping the resistance between the steel structure and the soil very high and by supplemental cathodic protection.

A 24-inch, 400 psi pressure steam main was installed in 1956 in the lower east side of Manhattan by the Consolidated Edison Company of New York, from the East River to Burlington Slip Steam Station at John and Pearl Streets for steam distribution into lower Manhattan. The length of line was approximately 2½ miles.

A soil investigation indicated there were several sections where corrosion would be greater due to a tide water condition. In these locations the 24-inch main was to be encased in a 36-inch steel conduit. In the sections of lower corrosive soil, the line was to be encased in prestressed reinforced concrete conduit. In both cases the line and casing were to be prefabricated in 40-foot sections.

To insulate the steel casing from the soil, it was to be coated with Pitt Chemical hot line enamel, a fiber glass wrapper, a second coat of hot line enamel, an asbestos felt wrapper and finally, a rock shield pipe cover. The coating was electrically tested for resistance to insure against defects in the covering.

Each section of steel casing was electrically bonded to its adjoining sections by ½ inch diameter rods welded to the casing.

Cathodic protection was provided by magazine anodes. These anodes were bonded to the steel casing to set up a current to buck the corrosion current which would exist if the protective coating deteriorated or was damaged. Cathodic protection was also needed because the steel casing was mechanically and electrically connected to buried slab anchors.

Anodes were placed in anode stations and a station was placed near each slab anchor. The stations were comprised of 4 Galvo Pak type magnesium anodes, each weighing 32 pounds and were electrically connected to the steam main's steel casing.

The steam main was divided electrically into several sections by installing insulated flange joints. These insulated joints consisted of a pair of flanges with a high pressure rubberized base gasket, formica insulating sleeves around the bolts and formica insulating washers under bolt heads and nuts.

After the line was installed, test data indicated the current flow at the various anode stations varied from 20 to 840 milliamperes and from 5 to 210 milliamperes per anode. These indicate anode life ranging from 9 to 365 years. Within the anodes' lifetime, reasonable protection against corrosion should be provided.

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Grease Interceptors

IN the plumbing sanitary piping system it is of utmost importance to keep the soil and waste lines clear of any foreign objects or materials that may tend to clog them. Therefore, cleanouts are provided in the system to permit access to the point of most probable stoppage to facilitate cleaning.

This same consideration must be applied to that part of the sanitary system that is subject to stoppage by grease, fat and similar substances. This type of stoppage problem is usually confined to that part of the piping that receives waste water from certain kitchen

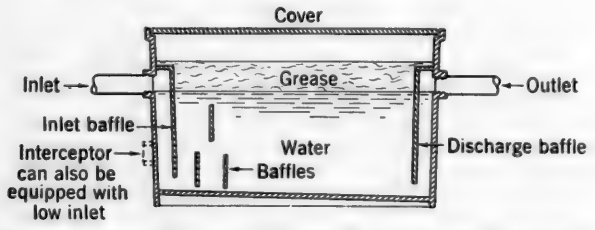


Fig. 1. Manner in which a grease interceptor functions.

fixtures and equipment. Although cleanouts will permit clearing the stoppage, this task is rather difficult with a line that is clogged by grease or fatty substance. Other means must be employed to intercept the grease before it reaches the inaccessible waste piping that serves the fixtures. This problem is particularly pronounced in larger commercial kitchens where grease and fat is discharged in much greater quantities.

Pot sinks are a major contributor to this condition; dishwashers are also a worthy contributor as are numerous other kitchen fixtures. To safeguard the waste piping, grease interceptors are installed and they function to intercept and retain the fats until the accumulated mass is removed during a periodic cleaning of the unit.

Types of Interceptors

Grease interceptors of many types and description are available. These range from basic types where the cover must be removed from the unit in order to scoop out the accumulated grease, to types that are equipped with a draw-off valve. By a manipulation of the draw-off valve at the discharge side of the interceptor, after warm water has been run through the unit to liquefy the grease, it is then possible to draw-off the grease at a spigot under which a pail or pan is placed. Another type of manufactured unit utilizes enzymatic compounds which must be added to the unit daily or at prescribed intervals to act upon the grease. The enzymes, according to manufacturers' literature, break down the particles of grease to the extent where they are easily discharged with the waste water. Still another manufactured unit is constructed with internal coils through which cold water passes to assist in the interception and solidification of the matter. There are several other types of grease interceptors, each with special features all devoted to the same purpose of intercepting grease and fat.

Details of grease interceptor installation are illustrated and described in this article.

Operation of a Grease Interceptor

Figure 1 represents in basic detail the component parts and operation of a grease interceptor. The unit shown is diagrammatic and drawn so that it will not resemble any of the manufactured units on the market.

Referring to Fig. 1, note that the waste water containing grease and fat enters the interceptor where baffles

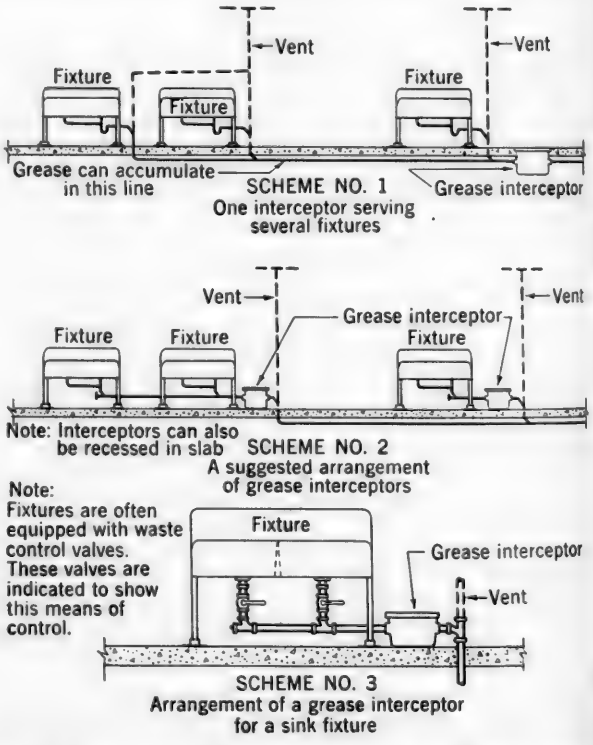


Fig. 2. Several methods for installing grease interceptors.

of one type or another reduce the water turbulence and assist in separating the grease matter from the water. Since fatty material is lighter than water, it will float and congeal. The waste water then passes on through the unit and discharges into the waste piping as shown. The accumulated grease is then removed or disposed of by the method employed by a particular unit. Most units can be equipped with an inlet in one of the two positions shown on the detail.

Construction of Grease Interceptors

Grease interceptors are constructed most generally of cast iron. Some units are made of vitreous glazed earthenware. Grease interceptor extensions are usually constructed of either cast iron or steel. Larger sized grease interceptors are constructed or fabricated of steel and are painted with special compounds.

Covers for the grease interceptors are constructed of cast iron or steel. Steel is mostly used for the larger sized units. Aluminum covers can be provided, and possess the advantage of being easily lifted.

The inlet and outlet connections for the unit are generally threaded for the watertight conditions they offer.

Capacity

The capacity of an interceptor is rated in gpm (gallons per minute) which indicates the quantity of waste water the unit can handle and yet function to separate the grease from the water. The amount of grease that

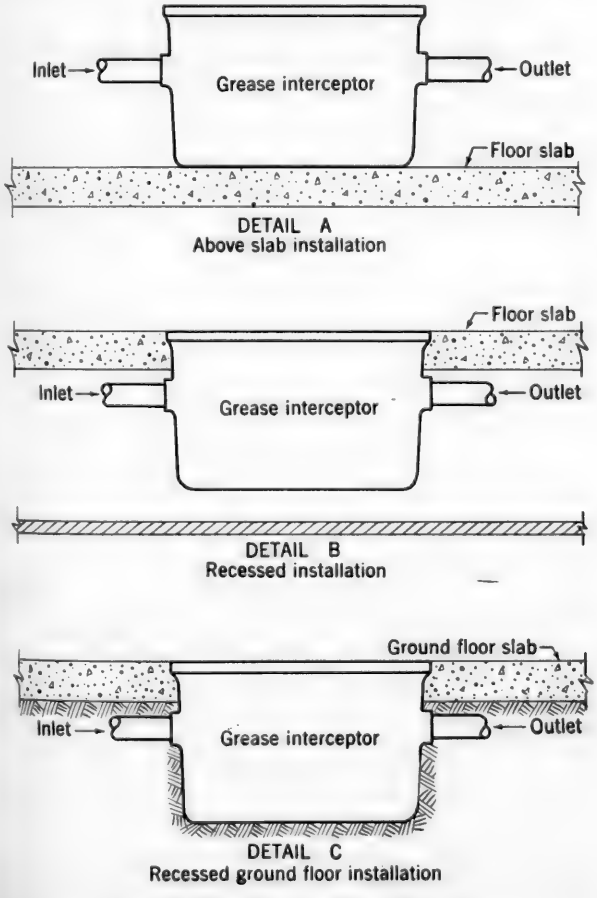


Fig. 3. Three types of installation.

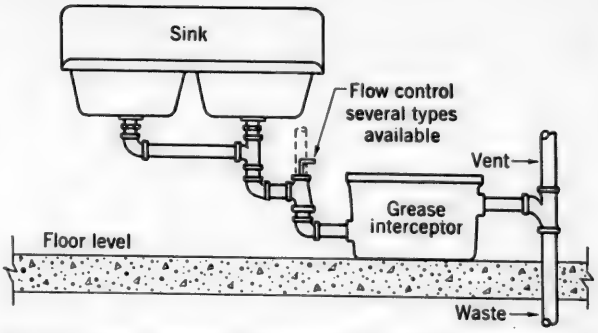


Fig. 4. How a grease interceptor is installed to serve a sink fixture.

can be stored in a grease interceptor is rated in pounds. The amount of grease separated and stored determines how frequently the unit must be cleaned. This data can always be worked out with the manufacturer of the particular unit desired.

It might be mentioned here that grease interceptors may be obtained in different sizes ranging from approximately 4 gpm to 500 gpm. When required, larger sizes can also be furnished.

Location of Grease Interceptors

Since most interceptors have been tested by an approved testing laboratory, the engineer is assured that the units will perform with a high degree of efficiency. However, the proper placement of the unit on a horizontal plane is an important consideration. If the unit is placed too far away from the unit served, the grease will congeal in the waste line between the fixture and the interceptor. On the other hand, when the interceptor is placed too close to the fixture, there is danger that the grease will not congeal due to the high temperature of the water used at the fixture. In this instance, there is a tendency for the grease to pass right through the interceptor with the water. Thus, the engineer must evaluate the situation and place his proposed unit according to one of the schemes shown in Fig. 2.

Scheme No. 1, shows how a grease interceptor is often installed to serve two or more fixtures. In this case one interceptor is used to handle three fixtures. The first two fixtures are located a distance away from the unit. It is very possible that the grease will congeal in the waste line between the fixtures and the unit by virtue of the long run the grease must travel. Therefore, this line must be periodically cleared of the accumulated matter; the third fixture, however, will function in a normal manner.

A method that may be used to correct this problem is illustrated in Scheme No. 2. Here you will note that one unit is installed to serve the first two fixtures while a separate unit is employed to serve the third fixture. Although two units are used, they are smaller sized units. The installation cost may slightly exceed the first plan but the nuisance of periodically clearing a clogged line has been eliminated.

Scheme No. 3 shows an interceptor that is installed too close to a fixture from which excessive hot water in large quantities is continually being discharged. The hot water and grease will pass right through the interceptor and into the waste piping where it will congeal as it cools. In normal use, the interceptor will contain

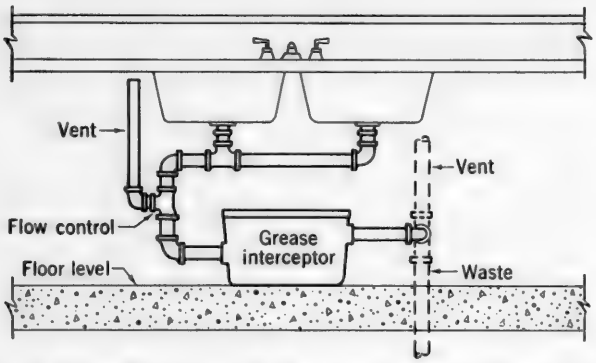


Fig. 5. An installation of a grease interceptor under a sink showing vents.

a quantity of water that has cooled sufficiently to lower the temperature of the new quantity of waste water discharged into it. Intermittent quantities of hot and cold water dispensed at the fixture will tend to help the function of the interceptor. If, however, one knows in advance that abundant quantities of exceedingly hot water will be dispensed, then thought must be given to the interceptor installation. In this case, a water cooled interceptor can serve a very practical purpose. Otherwise it is advisable to omit the interceptor at this fixture, since it certainly will not do the job it is expected to do. A grease interceptor must be carefully located and installed with respect to the use of the specific fixture it is intended to serve.

Installation of Grease Interceptors

Interceptors may be installed in one of several ways illustrated in Fig. 3. Detail *A* shows the unit installed above and resting on the floor while Detail *B* depicts the unit recessed in the floor slab. Detail *C* illustrates how the unit is recessed in a ground floor slab. When the interceptor is installed in the floor slab as shown in Detail *B*, due consideration must be given to the weight of the unit and the best manner of supporting it. This matter will be covered in more detail in the next article.

Typical Application

Figure 4 portrays the way an interceptor is often installed to serve a sink fixture. The unit is placed near the fixture and in this instance is placed above the floor. A trap has not been included on the waste piping under the fixture because the interceptor in this particular installation serves as a trap. The engineer may follow any method he favors for the installation. A flow control valve has been placed at the inlet side of the unit and its prime function is to regulate the flow of waste water into the unit. Each manufacturer, can supply a similar type of device for this purpose. By regulating the flow of water into the unit, the turbulence can be lowered and this permits a more efficient separation of grease from water. If desired, the interceptor can also be recessed in the floor.

Under Fixture Installation

Quite often it is required to install the grease interceptor under the fixture it is to serve. When this situation is encountered, the unit may be installed in a manner similar to that shown in Fig. 5, where the unit is directly under the fixture and the waste piping arranged to accommodate it. Once again, a flow control valve is used to regulate the flow of waste water into the interceptor. The vent is a necessary part of the flow control valve and allows atmospheric pressure to balance the flow of water through the control valve. If desired, the grease interceptor can also be recessed in the floor to satisfy a particular installation. The grease interceptor is installed under a fixture when by nature of the sink and counter top, other equipment as shelves or utensil drawers are placed or built-in next to the sink unit, thereby confining the installation of the unit to a space under the fixture.

Multi-Story Installations

When a building owner requests that interceptors be installed for the sinks of say an apartment house building, the units may be installed as suggested in Fig. 6. System No. 1 shows the interceptor located at each fixture. Although the flow control valve has not been shown at each fixture, the engineer may include them if he so desires.

System No. 2 shows how a grease interceptor can be installed in the basement or cellar of a building to serve the sinks located on the floors above. For this installation, the flow control valve is a must to regulate the flow of water that will enter the unit. The method of venting that is illustrated is only suggestive for the engineer may utilize any method he favors. Often, the local plumbing code will cover the manner in which the interceptor and component waste and vent piping should be installed. Where this is the case, it is always good practice to consult with the proper authorities and conform to their prescribed methods.

In addition to trying to protect the waste piping in a building and to prevent it from becoming clogged by grease, the grease interceptor is many times needed to prevent the matter from entering the septic tank or other individual disposal means on the property.

Next month's article will describe some of the special means for installing grease interceptors.

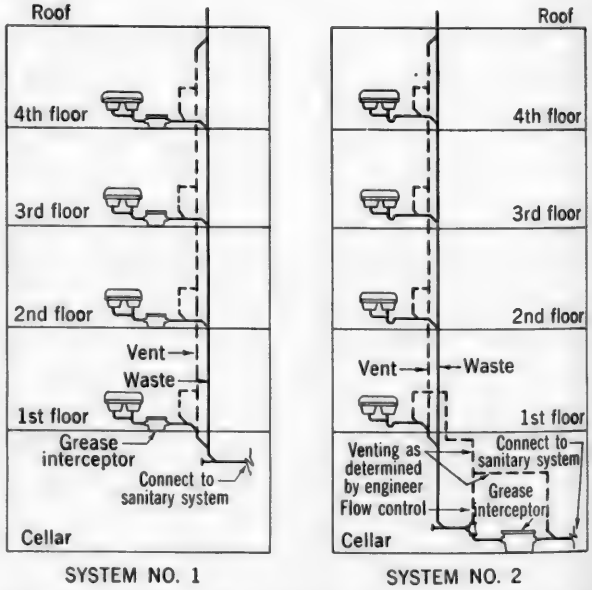


Fig. 6. Two methods commonly used in placement of grease interceptors.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

15-Ton Air-Cooled Unit

Production is begun on an improved 15-ton, air-cooled, air conditioner for commercial application. The new units will be part of the Champion line of commercial units manufactured by York Corp., York, Pa., subsidiary of Borg-Warner Corporation. New condensing units and evaporators guarantee a full 180,000 Btu per hr of cooling, the company states.

Units are designed especially for suites of offices usually occupied by small businesses, professional groups, and small stores where high internal loads frequently require cooling even at low outside temperatures. The unit will provide cooling with outside temperatures down to 0 deg F.

Twin refrigeration circuits are supplied with one evaporator step-controlled, or separate twin evaporators are supplied either step or independently controlled. The evaporators can be mounted horizontally or vertically, with or without heating coils. Control circuits will feature simplified wiring with a minimum number of interlocking relays permitting operation of either circuit, or both, through a single, two-stage thermostat.

More information? Circle Item 1, postcard, last page.

Off-Hour Heating Control

An off-hour control of motor driven fan heating units is introduced by Illinois Engineering Co., Chicago, Ill. The Illinois Night Control is a compact, pre-wired package that eliminates on-the-job wiring. It has wide application to heating and air conditioning systems in schools (including unit ventilator systems), churches, industrial plants, commercial buildings, shopping centers, or any place where it is desirable to automatically adjust temperatures during unoccupied periods.

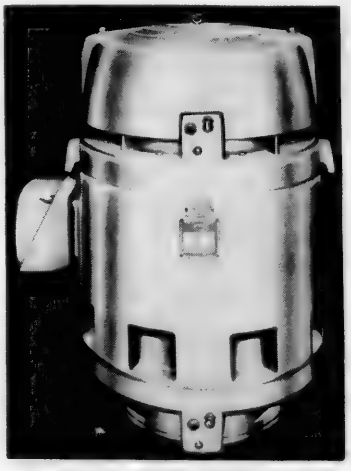
Included in the night control cabinet is an automatic time clock, a low-limit thermostat, a magnetic contactor and a manual selector switch. The night control can shut off the fan motors either singly or in groups, then permit the heating unit to continue to provide a tempering effect in the controlled area by convection. When the space temperature drops below the desired level the control again starts the fan which operates until the proper temperature is reached. Illinois Night Control does not interfere with normal temperature regulation nor duplicate the function of other devices or equipment. It supplements them to reduce needless motor operation.

Its automatic time clock can be dialed to a one or seven day program and may be set to control the fan motors by means of the magnetic contactor, which is available in three sizes with a maximum ampere rating between 9 and 22.

More information? Circle Item 2, postcard, last page.

All-Weather Motors

Availability of its all-weather Climatized vertical hollow shaft motor in ratings to 2,000 hp is announced by The Louis Allis Co., Milwaukee, Wis. Motors are designed for indoor and unprotected outdoor service in irrigation, municipal, petroleum, public utility, and industrial pumping applications. They feature compact construction and use of insulating materials that provide optimum resistance to moisture and chemical contaminants and have high mechanical strength, the company states.



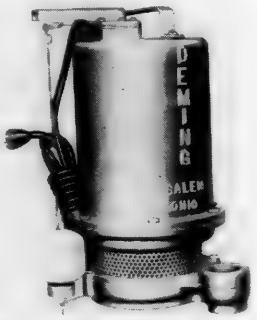
A maximum of two-high angular bearings is used in the motor to prevent excessive wear and reduced thrust capacity. Water-cooled Kingsbury type thrust bearings are utilized in extra-high thrust applications. For bearing protection the motor has an oil-metering system, sealed bearing chambers and Alnico magnet drain plugs that collect foreign ferrous particles in the oil. Design is said to allow bearing inspection of the largest motor in 5 min.

Because of high motor efficiency a minimum of cooling air is required. This permits low cooling air velocity and prevents dust and moisture from being drawn into the motor by the air stream. Ninety degree bends in the air flow system prohibit the entrance of snow and rain; non-corrosive screens, the entrance of foreign matter and rodents.

More information? Circle Item 3, postcard, last page.

Submersible Cellar Drainer

The Deming Company, Salem, Ohio, has begun to manufacture a new submersible type cellar drainer. Called Fig. 4664, the submersible cellar drainer can be fully submerged without damage to the motor. The manufacturer claims that this is a particular advantage in case of power failure.



Compact and easy to handle, the unit is a centrifugal type pump with a cast iron casing and glass-filled polyester enclosed impeller. The casing is bolted to the cast iron motor support.

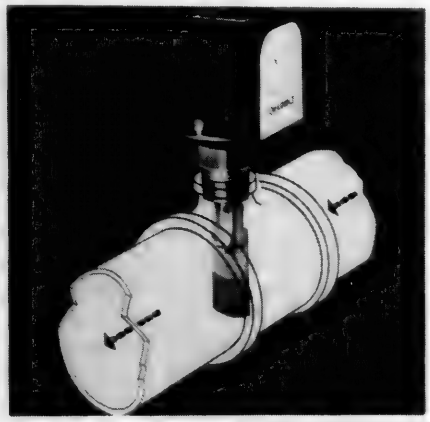
Motors for the cellar drainer are ⅓ hp, 60 cycle, 115 volt (standard), split case operating at 1725 rpm, and have built-in thermal automatic overload protection. The motor itself is enclosed in a heavy cast iron casing. The shaft is sealed with a ceramic seat mechanical seal, and bearings require no lubrication. A positive snap-action float switch is fully enclosed and sealed. Floats are made of cellular polystyrene which is impervious to most common liquid except oil and gasoline.

More information? Circle Item 4, postcard, last page.

Flow Switch Line Expanded

Series FS4 flow switches are added to its line by McDonnell & Miller, Inc., Chicago, Ill. Described as dependable and moderate in cost, they will activate a signal, pump, burner, alarm, meter, or other equipment, when flow of liquid in a pipe starts or stops.

Illustration shows how the flow switch is easily installed in a tee on a horizontal run of pipe with the paddle extending down into the flow. Any flow of liquid in the



pipe moves the paddle and closes the switch to complete an electric circuit which remains closed until flow ceases. A reverse acting type is also available to open circuit when flow starts; close, when flow stops. Sensitivity to flow can be readily adjusted.

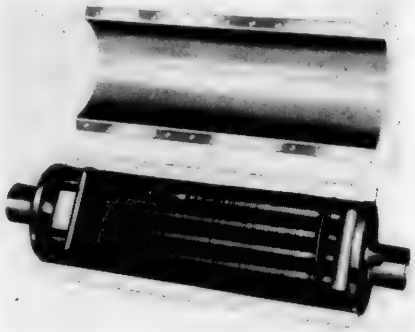
Typical applications are: starting burner in commercial water heater whenever draw of water occurs; stopping burner in swimming pool heater if flow is restricted in system; stopping compressor in air conditioning system if flow stops in cooling tower or chilled water lines; starting standby pump in case of failure of primary pump; and indicating flow or flow stoppage in process systems.

Switches are installed in a 1-inch pipe tapping. Paddle, assembled in 1-inch segments, can be adapted to fit 1-inch or larger pipe sizes. Leak-tight packless construction features heavy phosphor bronze bellows. All operating parts are brass, copper, or bronze so that the switch may be used with any liquid that will not attack these metals. Switch proper is the company's magnet-assisted snap-action design. Four models are available; two Underwriters' listed models for line voltage; two for use with self-generating millivolt systems.

More information? Circle Item 5, postcard, last page.

Waste Heat Reclaimer

A heat exchanger of fin tube construction is designed particularly for reclaiming of waste heat. Manufactured by Rempe Co., Chicago, Ill., it is recommended for application to exhaust steam, exhaust gas for gasoline and diesel engines, and waste hot gas from any other source.



The operation involves a transfer of heat from the hot gas to a fluid, which flows through the coil. Inlet and outlet connections for waste gas are at opposite ends of the heat exchanger. Available in copper, aluminum, steel, or stainless steel, with open shell, as shown, or closed shell, the reclaimer is suitable for temperatures to 1500 deg F. Units are sized for individual applications.

More information? Circle Item 6, postcard, last page.

Controls for Water Systems

Water systems controls, that use a single pair of leased telephone wires, are manufactured by Femco, Inc., Irwin, Pa. Either remote manual control or automatic control of complete systems is available.

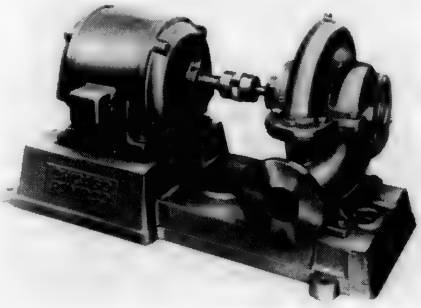
From a panel at the filter plant control room, or other strategic location, valves are opened and shut, pumps operated, reservoir levels indicated, and a complete system monitored and operated. System components include audio tone units for *on-off*, or continuous controls, or for telemetering; circuit scanners, coupled to the audio tone units for control and indication of multiple steps and operations; consoles and cabinets.

More information? Circle Item 7, postcard, last page.

Horizontally Split-Case Pumps

Announcement of a line of Type S horizontally split-case, single stage, centrifugal pumps is made by Chicago Pump Co., Chicago, Ill., a subsidiary of Food Machinery and Chemical Corporation.

Pumps feature extremely quiet operation; short, compact overall dimensions; pre-lubricated bearings; and ceramic mechanical seals eliminating stuffing box drip and piping to drain. Pumps are manufactured to precision standards and include all late engineering advancements, the manufacturer pledges.



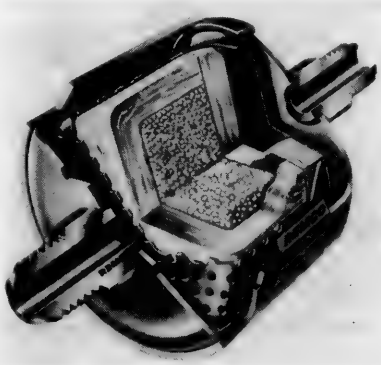
Suitable applications include air washing, chilled water and cooling tower circulating for air conditioning systems; use as booster for increasing city water pressure; as boiler feed, condensation pump, or hot water circulating pump in heating systems; also in pneumatic systems and for ethylene glycol circulating in snow melting systems.

More information? Circle Item 8, postcard, last page.

Sealed-Type Filter-Drier

A sealed-type filter-drier, as illustrated, is announced by Remco, Inc., Zelienople, Pa. For use in air conditioning and refrigeration systems, they combine the drying properties of Linde Molecular Sieves with filtering in depth.

The desiccant is said to absorb and retain large quantities of moisture at liquid refrigerant temperatures of 140 deg F, while holding moisture concentrations at 10 ppm or less. Acid concentrations are held below dangerous corrosion limits.



The large filter which surrounds the desiccant will remove all scale, sludge, carbon, and other particles as small as 100 microns, the company states. A Dutch weave wire cloth screen is provided in the outlet for added protection.

Sealed type is available in ½ to 12-ton capacities with sweat or flare connections. A replaceable cartridge type is also available that will handle capacities to 40 tons.

More information? Circle Item 9, postcard, last page.

Voltage Testing Package

A testing device, called Meter-Lite, combining a voltage tester, a continuity tester and a compact flashlight encased in an unbreakable case no larger than a regular pack of cigarettes, is offered by Cessco Industries, Albany, N. Y.

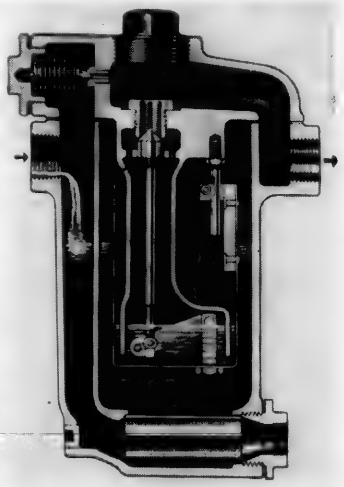
The device is seen as being of particular interest to service and maintenance personnel concerned with testing anything electrical. Two 12-inch test leads are included in the package.

The instrument may be used to test for continuity of high resistance circuits; determining whether power source is a-c or d-c; and locating ground side of power supply. Available in ivory, tan, green or red.

More information? Circle Item 10, postcard, last page.

Traps for Varying Pressures

Series 500-C open float and thermostatic traps, offered by Wright-Austin Co., Detroit, Mich., are designed for varying pressures from zero to 150 psig. According to the company the new line will cover about three-quarters of all trap applications, providing faster warm up and efficient handling of entrainment in every stage from cold start to saturation temperatures.

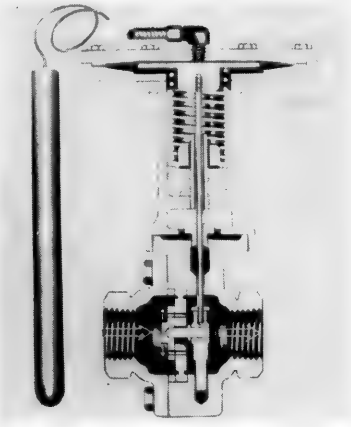


Three advantages of these traps are claimed: (1) faster warm up through more efficient venting and discharge of air and condensate in the preliminary stage, (2) ability to discharge at 1 and 2 deg below saturation temperature to keep equipment hotter after warm up, and (3) accessibility of all parts for service without removal of trap from line. A new by-pass thermostat, built into the trap, is of the liquid-filled, monel bellows type said to faithfully follow the steam temperature curve.

More information? Circle Item 11, postcard, last page.

Plastic-Coated Bulb

A plastic-coated sensing bulb and thermal system is available with all sliding gate temperature control valves from the Jordan Industrial Sales Div., OPW Corp., Cincinnati, Ohio. The valves are manufactured for use in plating tanks, chemical tanks or heaters, and other corrosive applications.

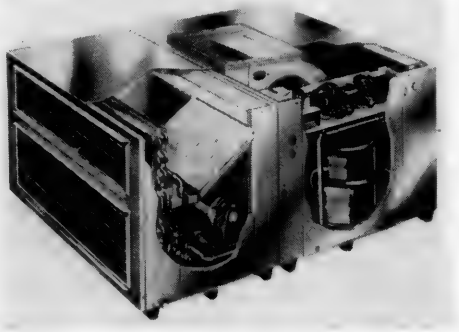


The entire thermal bulb and capillary tubing system is heavily coated with a protective, heat-conducting plastic film, said to afford economical corrosion resistance to a broad variety of chemicals at temperatures to 185 deg F. Capillary tubing is available in 8 and 15-ft and special lengths. Valves are available in sizes of ¼ inch through 2 inches. Comprehensive Bulletins SRB 16-58 and J-180 give full information.

More information? Circle Item 12, postcard, last page.

Horizontal Heat Pump

A horizontal heat pump, offered by Lennox Industries, Inc., Marshalltown, Iowa, features flexibility of installation. Available in versions which range from 3 to 5 tons nominal cooling capacity and from 12,500 to 21,500 Btu per hr heating capacity (less strip heaters), indoor and outdoor sections may be close coupled to form a single package. The package may be installed on the flat roof



of a residence or commercial building, or outside the structure at the foundation line.

When split, the indoor section of the unit may be installed above a closet, in the attic, in the basement, or crawl space. The outdoor section is low enough to place under a window sill. Addition of an optional, acoustically-lined discharge hood makes possible installation through garage or carport wall.

Compressor operates with condensing temperatures as high as 145 deg F and with evaporator temperatures below zero. Defrosting is controlled by a thermostat which senses both air and refrigerant temperatures and is unaffected by air flow variations, the company states. Extra coil is provided in the indoor section for the heating function. During the cooling cycle, a portion of the indoor coil is cut off.

More information? Circle Item 13, postcard, last page.

Add Commercial Grade Fittings

Low-priced commercial fittings are added to the Double Diamond line of products produced at W-S Fittings Works, Forge and Fittings Div., H. K. Porter Company, Inc., Roselle, N. J. Named commercial fittings to differentiate from regular W-S code fittings, they include hex bushings, caps and plugs.

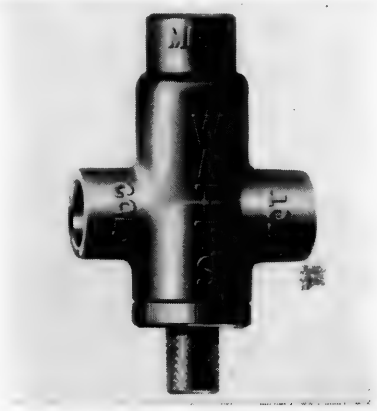
Although competitively priced, the fittings will adhere to a consistent guaranteed analysis, the company states. For convenience and economy in handling, they will be packed 100 to a carton, which will be labeled gray for easy identification. While not intended for severe code applications, they are suitable for 300-lb steam at 555 deg F. Fittings will conform to American Standard Pipe Threads, ASA B 2.1.

More information? Circle Item 14, postcard, last page.

Valve Has Powerful Thermostat

A low-cost tempering valve, No. 70, is offered by Watts Regulator Co., Lawrence, Mass. It boasts a thermostat powerful enough to penetrate any accumulation of lime or scale, thereby guaranteeing many years of positive shutoff.

The thermostat, developed and manufactured by the



company, completely shuts off the cold water supply when there is excessive demand for hot water, assuring delivery of the system's full-rated capacity.

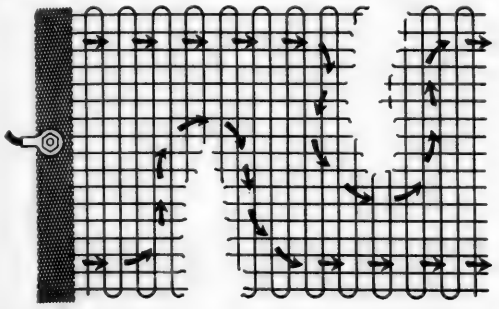
Available in ½-inch size with sweat copper fittings, the tempering valve is easily adjusted over a wide range. The manufacturer states that quality and dependability have not been sacrificed to the valve's moderate price.

More information? Circle Item 15, postcard, last page.

Wire Mesh Heating Element

A wire mesh surface heating element of "self-mending" design is offered by Electrofilm, Inc., North Hollywood, Calif.

Thirty-six wires per inch of width run longitudinally to carry the current. Thirty wires per inch of length run perpendicularly to the current flow, and distribute



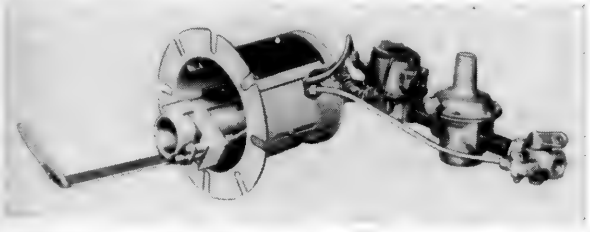
the current in case of a partially open circuit. This automatic distribution of current around a damaged area (see illustration) is the "self-mending" feature.

The basic fine wire mesh is interwoven with high temperature resistant glass or ceramic fibers for strength. One form in which the heating element is available is as a detachable form-fitting unit adaptable for hard-to-fit contour shapes. It is also available bonded to a part at the company's facility, and as a blanket heater for use on tanks, etc. Weighing 0.1 lb per sq ft, and 0.012 inch thick, it operates on voltages from 6 d-c to 220 a-c.

More information? Circle Item 16, postcard, last page.

Cast Iron Inshot Burner

Reported by the manufacturer, Adams Manufacturing Co., Cleveland, Ohio, to be rugged in design and powerful in performance, Model HS tubeless cast iron inshot gas conversion burner comes completely assembled as shown, all ready for speedy, one-man installation. It is said to easily and economically convert oil-fired furnaces and boilers to safe, automatic gas heat, including most revertible flue furnaces. It comes fully equipped with choice of self-generating or 24-volt controls; manifold sizes are ½ and ¾ inches.



Features include tubeless, compact construction, for installation in 4-, 5-, or 6-inch openings; a dynamic range of input from 80,000 to 180,000 Btu per hr on all gases; complete factory assembly with mounting flange, flame spreaders and manifold all in place. For installation, all that is required is to connect the burner to the gas line and drop thermostat wire. No combustion chamber alteration is necessary, and a specially designed snap-out panel acts as an automatic safety control against any possibility of flash-back. Pilot and orifices remove easily for cleaning.

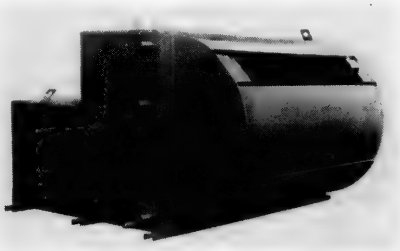
The burner is also featured in a Model HL tubeless cast iron inshot with a longer venturi length for installation in deeper combustion chambers. This model also comes completely assembled and fully equipped.

More information? Circle Item 17, postcard, last page.

High Pressure Air Handling Unit

Drayer-Hanson, Div. of National-U.S. Radiator Corp., Los Angeles, Calif., announces its entry into the field of high-pressure equipment design and manufacture.

First in the new line, designated HCD, is a high pressure hot and cold deck air handling unit. Capacities are expected to range from 5000 to 25,000 cfm. Features



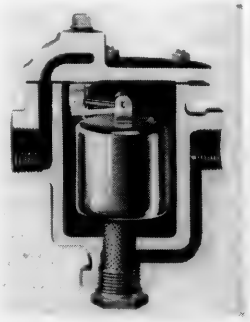
include dual forward curve fans; internal vibration isolation of fans and motors; high pressure construction throughout; and diffusers for even air distribution over coil face.

Purchaser has option of horizontal or vertical discharge. Heavy channel runners are supplied for shipping and ease of on-job handling.

More information? Circle Item 18, postcard, last page.

Traps Have Built-in Strainers

Hoffman Specialty Mfg. Corp., Indianapolis, Ind., announces the addition of inverted bucket traps with built-in strainers to its present line of bucket traps. Available in ½ and ¾-inch sizes, Model No. 600-AS trap eliminates the need for a separate strainer, thus saving space, time, and trouble of two extra threaded joints and a nipple.



Trap features straight-through pipe connections, semi-steel body, stainless steel pins and seats, and all other interior parts of brass. All working parts are connected to the cover for easy removal. Strainer is of brass with 0.045-inch perforations and a free screen ratio of 4 to 1, and is easily removed for cleaning through the bottom plug. Pressure range is from 0 to 250 psi.

More information? Circle Item 19, postcard, last page.

Multiple-Head Nozzle

A pneumatic atomizing nozzle for simultaneous spraying in two or more directions has been announced by Spraying Systems Co., Bellwood, Ill.

This nozzle provides a compact, simplified method to meet multiple position spraying needs in a wide variety of industrial applications. The nozzle can be supplied with two, three or four heads, with each adjustable to any position in a 360° range.

A typical application is the spraying of lubricant on die faces, where the opposed male and female dies are automatically sprayed at one time during the open part of the cycle. The overall nozzle unit is extremely compact, measuring 1¼ by 2 inches at maximum cross-section and 4-13/32 inches in overall height with two swivel heads. Additional swivel heads each add 1-3/32 inches to the height. Nozzles are supplied standard in brass and are also available in stainless steel.

More information? Circle Item 20, postcard, last page.

Sheet Metal Elbows

Consolidated Ventilating & Duct Co., Inc., Jackson Heights, N. Y., announces production of heavy-gage sheet metal elbows with no transverse seams. They are stamped in two halves and both spot welded and arc welded.

Designed for high pressure air conditioning systems, elbows are said to be well suited for dust collecting systems and for industrial systems where round ducts or spiral wound pipe are used. Sizes from 3-inch through 12-inch diameters in a variety of gages are available.

More information? Circle Item 21, postcard, last page.

Recording Hygrometers

Weksler Instruments Corp., Freeport, L. I., N. Y., expands its line of recording hygrometers and psychrometers with the addition of two units, Hygrograph and Thermo-Hygrograph.

The Hygrograph, illustrated, records percent of relative humidity directly, without conversion, through the use of a precise hygroscopic hair element. A low-friction linkage converts the non-linear expansion of the hygroscopic element into linear motion at the recording pen, permitting the use of a chart uniformly graduated from 0 to 100%.

The Thermo-Hygrograph offers easy comparison between relative humidity and temperature, with both being recorded simultaneously. The two-pen recorder incorporates a sensitive and accurate mercury-actuated temperature system with a range from 0 to 100 deg F.

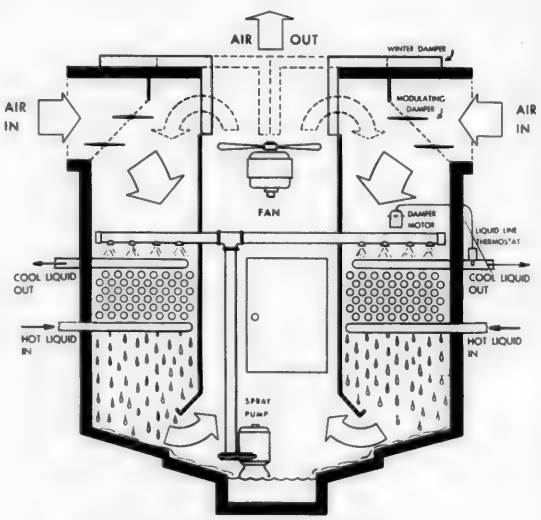
In aluminum case with black wrinkle finish, the units are available for portable or wall mounting. Charts are available in 8, 10 and 12-inch sizes. Standard chart rotation is 24 hours (electric or hand-wound), with other periods optional.

More information? Circle Item 22, postcard, last page.

Expanded Heat Exchanger Line

Winter-Summer models are added to its line of Aero heat exchangers by Niagara Blower Co., New York, N. Y. Complete protection from freezing in extreme winter climates is offered.

The basic principle of the machine is the cooling of a liquid by the evaporation of a small amount of water on the surface of tubes through which the liquid passes. The machines maintain temperature control within close limits by varying the amount of outdoor air flow across the coils, adjusting the capacity to the load, removing heat at the rate of input.



The Winter-Summer models enclose the air modulating dampers in a casing and provide for restriction of air supply by a manually operated damper in winter climates where the temperature remains below freezing temperatures for extended periods. See illustration. Automatic modulating damper operation continues, maintaining the close temperature control. Heat supply for warm up periods or between shut-downs is available from an outside source.

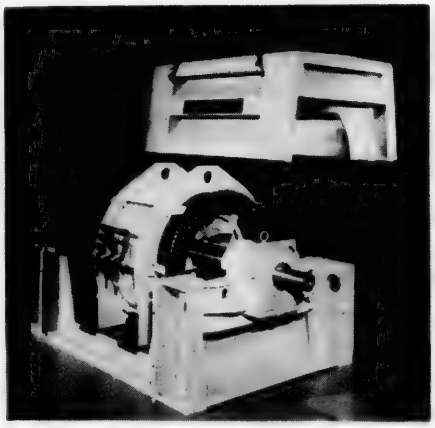
These features are available on sectional models in which the cooling coils are supported by the spray pan and the main foundation. The entire casing consists of removable panels giving complete access to all internal parts. Unit water cooling capacities in these machines range up to 18 million Btu per hr. Applications are to all industrial fluid cooling systems, liquids and air and gases, millwater systems, coolant systems, and temperature control of machine and chemical processes.

More information? Circle Item 23, postcard, last page.

Motor Design Revamped

A new design for large a-c motors is announced by Westinghouse Electric Corp., Pittsburgh, Pa. The design of the F/A (Fully Accessible) motor permits the enclosure to be manufactured independent of the wound stator. During assembly the enclosure is merely bolted to the base of the motor making the wound stator fully accessible when required. Previously, the enclosure was welded or cast as part of the wound stator, limiting accessibility.

As a result, the complete line of Westinghouse squirrel-cage, wound rotor, and synchronous motors from 250 to 7000 hp (depending on speed) for all horizontal utility and industrial drive applications have been redesigned to use only 6 basic enclosures and 30 frame sizes as compared to 450 frame sizes formerly used.



Key advantages of the motor design are said to be: (1) The stator is accessible for thorough inspection. Enclosures are quickly removed, easily replaced and require no realignment; (2) The protruding conduit box is eliminated; (3) Noise mufflers, air filters and all types of accessories can be added to the motor without any redesign of basic parts; (4) Standardization is possible, because each motor frame size replaces 16 of the previous lines; (5) The purchaser gets immediate service on outline drawings, and faster service on replacement parts; (6) The user gains in quality because of precision manufacturing methods; (7) The motors can be delivered faster because of improved production schedules.

Photo shows side panels, end panels, end covers, and enclosure unbolted and removed, exposing bearing and wound stator.

More information? Circle Item 24, postcard, last page.

Expand Heating, Cooling Lines

An expanded line of Weathermaker heating and cooling products, featuring oil and gas-fired furnaces and a wider range of air conditioning sizes, is introduced by Carrier Corp., Syracuse, N. Y. Twelve gas-fired furnaces and 16 oil-fired models, all with increased air handling capacities for air conditioning, are announced.

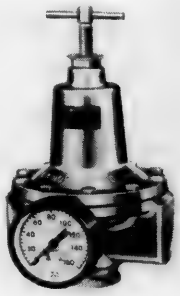
Gas fired units, available in upflow and downflow models, have outputs ranging from 75,000 to 185,000 Btu. The oil fired furnaces, in upflow, downflow, horizontal, and lowboy models, have capacities from 84,000 to 140,000. Fan motors no longer have to be changed when cooling is added.

Three condensing sections introduced enable the company to offer a range of capacities from 2 to 10 tons. Compactness of the equipment is demonstrated by the 3-ton models that are 25% smaller than previous units of the same capacity. The other models are in 7½ and 10-ton sizes for commercial installation. Combined with company's new ceiling- or floor-mounted fan coil units, the condensing sections can be installed outside to save valuable floor space.

More information? Circle Item 25, postcard, last page.

Water Pressure Regulators

A heavily brass-plated, zinc, die-cast body, with all other parts specially protected against corrosion, is featured in the new line of water pressure regulators offered by C. A. Norgren Company, Englewood, Colo.



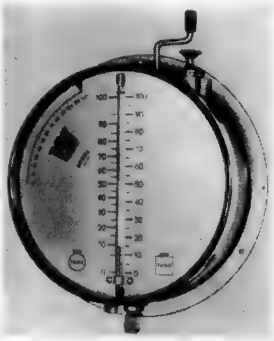
With such protective features to assure continuous, economical service, the regulators are said to provide accurate pressure control in spite of fluctuations in primary pressure and in rate of water flow. They are designed for large volume flow and quick response to sudden demands for greater volume.

Series 20AP regulators are offered at attractive prices in pipe sizes from ¼ through 1 inch, the company states. They are available with a choice of three pressure ranges: 0-50 psi, 0-125 psi, and 0-250 psi. Each is suitable for line pressures up to 400 psi and temperatures up to 200 deg F.

More information? Circle Item 26, postcard, last page.

Gage for Liquid Storage Tanks

Made in Sweden and distributed in the United States by Robert Barclay, Inc., Chicago, Ill., is the Gallo gage for liquid storage tanks.



One standard, low-priced gage can be used for all different diameters or heights of underground or above-ground storage tanks and for a wide range of liquids.

A chart is furnished with each gage showing the correct setting of the indicator, on the upper left, for tank height and specific gravity. Knob at bottom sets the indicator. Gage employs an easy-to-read mercury column in an 8-inch dia face.

More information? Circle Item 27, postcard, last page.

Three-Way Valve

A ¼-inch NPT 125 psi 3-way NC valve, especially designed for steam, hot and cold water, air and gas service, is announced by The Sinclair-Collins Valve Co., Akron, Ohio. The diaphragm-operated valve is said to

offer compact design for simplified installation, leak-free performance, low initial cost and minimum maintenance.

Body, yoke, ring, and piston are cast Navy M bronze, with cast iron body optional. Disc holders and gland nuts are bar brass, stem is stainless steel, and spring is chrome silicon steel. Adjustable stem packers and special composition seats assure leak-free operation in the specified service, it is said. Both stem packing and seat discs are easily replaced, when maintenance finally is required.

More information? Circle Item 28, postcard, last page.

Gas-Fired Unit Heaters

Ten gas-fired automatic unit heaters with capacities ranging from 25,000 to 250,000 Btu per hr input are announced by Ilg Electric Ventilating Co., Chicago, Ill. All models are available for use with natural, manufactured, mixed and liquefied petroleum gases, including LP gas-air mixtures. Controls for all gases are provided as standard equipment.

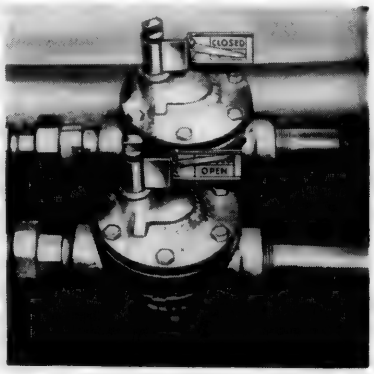
The manufacturer reports that the unit heater line has been newly designed for both commercial and industrial use. The units are said to be smaller and lighter in weight than most heaters with comparable capacities and that they are designed not only for attractiveness but easy accessibility of parts, simplifying maintenance.

Structural changes are not necessary to accommodate the lightweight heaters. A convenient hanger assembly, provided with the unit, can be adjusted to any mounting height by use of an inexpensive pipe. No couplings or unions are required to suspend the unit with the hanger assembly. Also, since the units are completely wired before shipment, they need only be connected to gas and electricity and have a suitable vent before being put into service.

More information? Circle Item 29, postcard, last page.

Automatic Trap Indicator

Announced by Hughes Machinery Co., Kansas City, Mo., is a device which indicates trap operation at a glance. Trap-Indikator, for use exclusively on Armstrong steam traps, is constructed of brass, aluminum and stainless steel, and is designed for maximum operating conditions of 250 lb at 450 deg F.



When trap discharges, the flow of water moves an internal piston upward. Permanent magnet in piston moves trap indicator needle to show trap *open*. When trap valve shuts, permanent magnet moves indicator needle to indicate *closed* on face-plate. Proper trap operation is indicated by intermittent face-plate readings of *open* and *closed*.

Maximum operating economy is achieved in the plant by low unit cost, low maintenance cost, simple installation, and the indicator's time-saving readability.

More information? Circle Item 30, postcard, last page.

Rubber-Asbestos Gasketing

A rubber-asbestos gasketing material, called Kaobestos, is introduced by F. D. Farnam Co., Chicago, Ill.

Improved conformability and tighter sealing qualities with minimum flange loadings are said to give this material a wide range of applications, including heat exchangers, compressors, diesel engines, and the automotive field. Among the features of this material are the absence of high and hard spots, and its relatively low cost, the company states.

Available in two grades of GRS, in Buna N, and in Neoprene, sheet sizes range up to 60 inches square; standard thicknesses from 0.015 to 0.125 inches. Heavier thicknesses can be laminated. Representative die cut gaskets, as well as sheet materials are available.

More information? Circle Item 31, postcard, last page.

Easy-to-Install Drum Switch

Bulletin 350, Series B, drum switch for starting, stopping, and reversing small a-c and d-c motors is announced by Allen-Bradley Co., Milwaukee, Wis. Switch is furnished in surface mounted NEMA Type 1 enclosures, or with an oiltight cover plate for cavity mounting in a machine base.

A newly designed, wraparound cover completely exposes the switch mechanism for easy wiring. In addition, terminal screws are accessible from the front instead of from the side. The edge of the enclosure base is raised so that the wraparound cover can be slipped off or on directly from the front, when the unit is mounted on its base. Thus, spacers are not needed for base mounting.

The switch mechanism is mounted separately from the enclosure, so that external forces that may distort the enclosure cannot cause binding in the switch. Changeover to momentary or maintained contacts is simple. With the cover removed, the locking screw on the operation selector plate is loosened, and the plate is moved to right or left. The locking screw is then retightened.

Units are available for 1½-hp, 110-v and 2-hp, 220-v, single phase motors; 2-hp, 110-220-550-v, polyphase motors; and ¼-hp, 115-230-v, d-c motors.

More information? Circle Item 32, postcard, last page.

Electronic Cabinet Filter

A filter panel designed for service where oil-free air is required is announced by the Air-Maze Corp., Cleveland, Ohio. The filter panel, known as the P-61 unit, provides a high degree of dirt removing efficiency for preventing entrance of objectionable dust particles into electronic cabinets and other electronic devices, the company states. Filtering efficiency, said to be generally greater than comparable filters of the impingement type, is attained with low pressure loss due to the extended area design of the media.

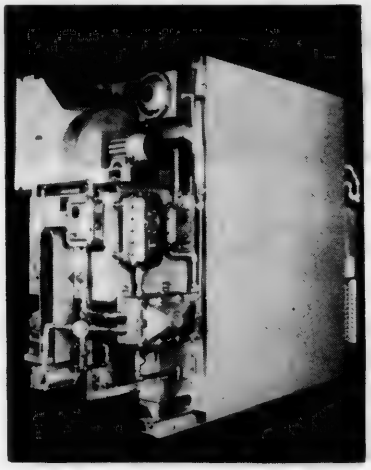
Suitable for operation at temperatures up to 350 deg F, filter unit is uneffected by changes in air velocity or variations in operating temperatures. The filter media is a highly bonded synthetic fiber sheet, sandwiched between aluminum screen, and pleated to provide its wide extended area. Panel may be washed in hot or cold water, with or without detergent solutions or other neutral fluids. This simple cleaning is especially important when panel is used in remote areas.

Standard rectangular sizes are ½ and 1 inch thickness, although other size specifications can be furnished on request.

More information? Circle Item 33, postcard, last page.

Large Dehumidifier

Production of Model 1500, the largest in its line of commercial space dryers, is announced by Dryomatic Corp., Alexandria, Va. This model is suitable for moisture control in warehouses and larger commercial storage areas. It will also find application in pharmaceutical plants and chemical processing facilities requiring a continuous supply of dehydrated air, the company states.



The dehumidifier can remove up to 40 lb per hr of water and is said to maintain humidity levels as low as 10%. The machine uses two beds of permanent silica gel drying agent. While one bed removes moisture from the air, the other is being regenerated. The most economical source of heat that is available, whether electricity, steam, or gas, can be used for regeneration. Adjustable timers provide the most economical operation according to varying weather conditions.

More information? Circle Item 34, postcard, last page.

Hydronic Heating-Cooling Units

Addition of Hydro-Vectors, hydronic heating and cooling units, to its line of hydronic heating and cooling equipment is announced by Hydrotherm, Inc., Northvale, N. J. Model HY-400 is rated at 3,950 Btu per hr with 42-deg chilled water, and Model HY-800 is correspondingly rated at 8,600 Btu.

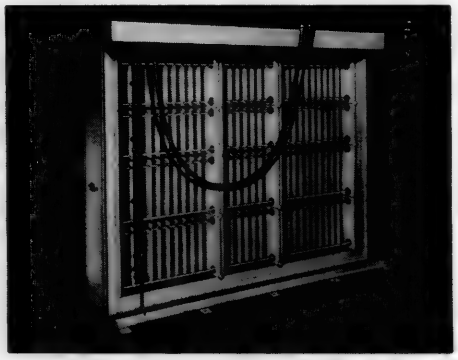
Essentially, the units are copper coil heat exchangers with centrifugal fans and filters, housed in compact, attractively finished steel cabinets which may be installed either free standing or partially or fully recessed. Together with the company's boilers and packaged water chillers, they make up a complete central heating-cooling package.

More information? Circle Item 35, postcard, last page.

Dust Precipitator

A high velocity electronic dust precipitator is introduced by American Air Filter Company, Inc., Louisville, Ky. Called Electro-cell, it is offered in a design which operates at face velocities up to 600 fpm. A size reduction of 30% in face area and 50% in cubic requirement over conventional precipitators is claimed. In addition, the unit is 16% shallower than other high-velocity units.

Sectional construction results in ease of assembly. Individual cells contain positive and negative collector



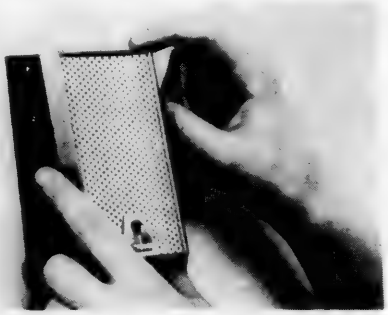
plates fixed in position. Each cell has its own set of vertical ionizing wires. This construction differs from the standard cell in that it eliminates a separate ionizer section. The initial cost is lower and the installation cost is reduced as well, the company states.

The all-aluminum collector cells are available in heights of 16 and 20 inches, and widths of 24 and 36 inches. Cell capacity ranges from 800 to 2750 cfm. Collection efficiencies up to 97% are obtainable.

More information? Circle Item 36, postcard, last page.

Line-Voltage Thermostat

A wall control for electric heating and cooling is developed by Mears Electric Controls (formerly Electric Controls, Inc.), Portland, Ore. Only ¾-inch deep, it has been designed with both decorating and engineering needs in mind. Finished in a "desert sand" color that



will go with anything, the company says, the face panel can be snapped out and painted to match or blend with any interior.

This line-voltage thermostat has a range from 35 to 90 deg F with a temperature differential said to be less than ½ deg. An air space between the instrument and the wall allows air to circulate in back, as well as in front, of the sensing element. Perforated face panel permits sensitivity to radiant heat. Unit cycles between five and nine times an hour to prevent excess heating or cooling of the unit it controls.

One feature, said to be popular with motels, hotels, and public buildings, is the control knob, which can be removed after the thermostat is set, to prevent tampering.

More information? Circle Item 37, postcard, last page.

5-inch Submarine Thermometer

A 5-inch submarine thermometer is announced by Albert A. Weiss & Son, Inc., Brooklyn, N. Y. Its red-reading mercury-in-glass tube affords sustained accuracy despite vibrations and shock, the company states.

Case is of one-piece, extruded brass construction, with a flatback design said to assure maximum rigidity. Spring pressure created by the V-scale secures the protective glass cover and prevents it from rattling. A formed cover plate, easily removable, completes the assembly.

The red-reading mercury tube is standard, and the V-shaped scale has extra large black numbers for maximum readability. The stem assembly is made of all-brass standard fittings. All current military specifications are met. Sockets are available in all metals.

The term "submarine" is used to describe the relatively small size of the instrument.

More information? Circle Item 38, postcard, last page.

Automatic Water Heater

An automatic, gas-fired, glass-lined, commercial storage and circulating tank water heater, called Burkay Model B-97, is announced by Permaglas Div., A. O. Smith Corp., Kankakee, Ill. It has an input of 97,000 Btu per hr with all gases, has a 70-gal storage capacity, and 81½ gph recovery at 100-deg temperature rise.

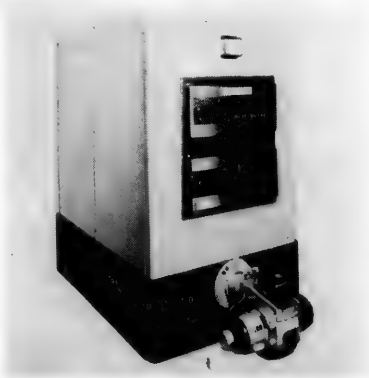
Other features include complete assembly requiring only water, gas, and flue connections; AGA approval for providing sanitizing hot water; and completely corrosion resistance. There is a choice of either horizontal or vertical draft diverters. The outer jacket is finished in gray hammerloid enamel.

The B-97 has a glass-lined tank, glass-coated both inside and out, and there is heavy Fiberglas insulation. The heater can provide either one or two temperatures. Two temperatures may be obtained by using a simple mixing valve.

More information? Circle Item 39, postcard, last page.

Oil Fired Boiler

Announced by Weil-McLain Co., Michigan City, Ind., is Model No. 82 oil fired boiler and oil heating unit. Designed for commercial installations, the unit is I-B-R



tested with a load range from 1300 to 3260 sq ft steam rating, and 2255 to 5290 sq ft hot water rating.

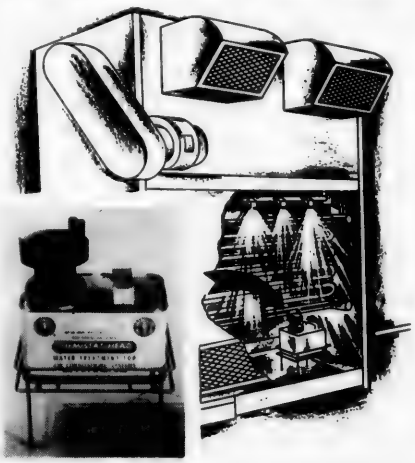
Features of the cast iron boiler-burner unit include one or two tankless, or storage, heaters with flexibility of heater arrangement; gas-tight asbestos rope seal between sections; and improved flueway design.

More information? Circle Item 40, postcard, last page.

Circulating Water Treatment

A unique method of applying chemical treatment to the circulating water in air conditioning systems, for the purpose of combating corrosion and scale, has been developed by Water Service Laboratories, Inc., New York, N. Y.

The method utilizes a Chemistat (proportional chemical feeder) that is small, portable and easily handled, and which is designed to be put into a cooling tower or evaporative condenser or air washer in such a position that some of the spray water falls directly on it. On top of the unit as shown in insert is a device called the Chemistat Head that catches a small amount of the



spray water and funnels it into the chamber that contains the solid chemical. After contact with the chemical the water flows out of the chemical container carrying a controlled amount of chemical with it in solution.

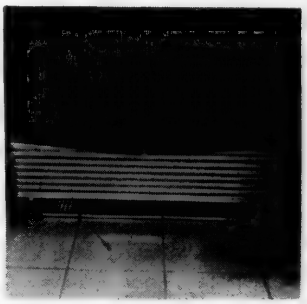
The whole chemical feeding unit weighs about 15 to 25 lb, depending on its size, and its operation is very simple. There are no mechanical parts to get out of order, and the device is automatic in that when water is circulating through the cooling tower or evaporative condenser, as shown, chemical is being continuously fed. It is necessary to feed the chemical continuously in a small stream to make up for that which is continuously being lost by windage, or by leakage of water around the circulating pump packing glands or elsewhere.

When the chemical contents of a container are exhausted, the Chemistat is simply lifted from the cooling tower pan, and a new one substituted for it. The "head" is unscrewed from the empty container and screwed on the new one.

More information? Circle Item 41, postcard, last page.

Flooring Makes Plenum

A raised floor that can take caster loads of 1000 lb per sq in. and a distributed 275 lb per sq ft and laid down directly onto existing floors without requiring a permanent supporting structure, has been developed by Floating Floors Inc., New York, N. Y. It is called a floating floor because its design makes it possible to lay, rearrange, or remove the floor with a degree of flexibility impossible in conventional flooring.



Floor is laid down by assembling 36½ inch square modules which rest on adjustable pedestals, as illustrated at left. Each module contains four cast aluminum plates placed in a steel frame. Whenever changes in space usage necessitate rearranging the floor, the completely interchangeable modules and plates can be raised with a hand suction-cup lifter. With the same lifter the floor can be picked up section by section and moved out for use in any other location.

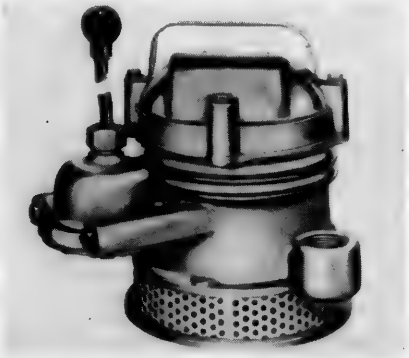
The fact that the floor is merely assembled and requires neither a supporting substructure nor any alteration to existing flooring results in a wide applicability. Chemical plants, industrial laboratories, television, film, or recording studios, telephone switchboard rooms, or any other installation using extensive piping, ductwork, or cables can use the floor to obtain both free access subfloor space and flexible, easily rearranged or moved flooring for machinery and other equipment. With this flooring, floors—in old and new buildings—can also be used as pressurized plenum chambers that supply air through registers, as illustrated on right. Floor becomes a radiant panel.

More information? Circle Item 42, postcard, last page.

UL-Approved Sump Pump

Approval by Underwriters Laboratories of its submersible sump pump with precision Micro-Switch is announced by Weil Pump Co., Chicago, Ill. Its pump is the first to receive such approval, the company states.

The pump is described as a rugged, compact unit with hermetically sealed ⅓-hp capacitor type motor with overload protection and reset. Rotating shaft seal is of the positive leak-proof type, so that if current fails, moisture cannot damage the motor. With a height of 11 inches and an 11¾-inch diameter, pump installs easily through a 15-inch opening; and can be placed in a metal tile or concrete sump 2 to 8 ft deep. Installation can be sealed and made gas-tight. Pump weighs 50 lb.



Recommended applications: basement drainage, drainage of valve pits, pump pits, and machinery pits.

More information? Circle Item 43, postcard, last page.

Photocopier Voltage Meter

The manufacturers of the Contoura-Portable photocopier, F. G. Ludwig, Inc., Old Saybrook, Conn., announce a voltage meter for field and office use with portable photocopiers. Called the Contourometer, the accessory eliminates timing guesswork in photocopying.

The regulator-meter has been developed for use with the portable model for copying blueprints, tracings, or specifications in the field. By using the meter to lock 110 volts in place in the engineer's or contractor's office, the correct amount of light hitting the copying paper may be selected under widely varying power conditions, or even peak load circumstances, in unfamiliar buildings.

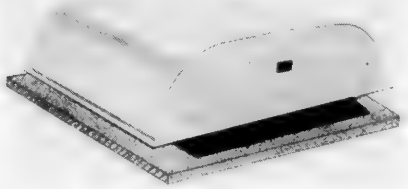
The portable photocopier has a unique plastic air-cushion said to make it possible to photocopy from bound books. By placing the machine face-down on the page, it follows the contour of the book right to the margin. In the same way, the machine can be used face-down to lift off important sections of drawings to save draftsman's time. The product is a crisp, black-on-white photo-exact copy. In the office, the photocopier may be used face-up to copy anything printed, written, or drawn in any colored ink, including red, and ball point pen.

More information? Circle Item 44, postcard, last page.

Centrifugal Roof Exhauster

Two significant factors considered in roof exhauster selection concerns housing height and fan noise. The new Type LC Dynafan, manufactured by Penn Ventilator Co., Inc., Philadelphia, Pa., is said to make an important contribution toward both considerations.

The overhung fan wheel design, common to many standard centrifugal roof exhausters, was created originally to keep the motor and drive assembly out of the air stream. This is an important feature when fans are required to exhaust fumes and vitiated air which may be harmful to motor and bearings. However, even where these conditions are not prevalent, the unit can be used at a considerable height saving. Quiet operation, longer bearing and belt life, and better balance are claimed to result because the wheel straddles both bearings instead of being hung out on the end of the fan shaft.



More information? Circle Item 45, postcard, last page.

Air Engineering Equipment

Niagara Blower Co., New York, N. Y., announces introduction of a series of units for air conditioning, refrigeration and heating, engineered for large industrial, food product process and storage, and commercial installations.

Included in this product group are six sizes of fan coolers for both floor and suspended mounting; six sizes of spray coolers; and Aeropass condensers in standard casing and sectional construction offering unit capacities up to 226 tons refrigeration with ammonia and 276 tons with freon. Line also includes fan (unit) heaters up to a million Btu per hr capacity, and coil surface type air conditioners up to 14,400 cfm air capacity.

All equipment has been specially designed for these applications with increased fan and heat transfer capacity, and compact, narrow casing units for more convenient installation.

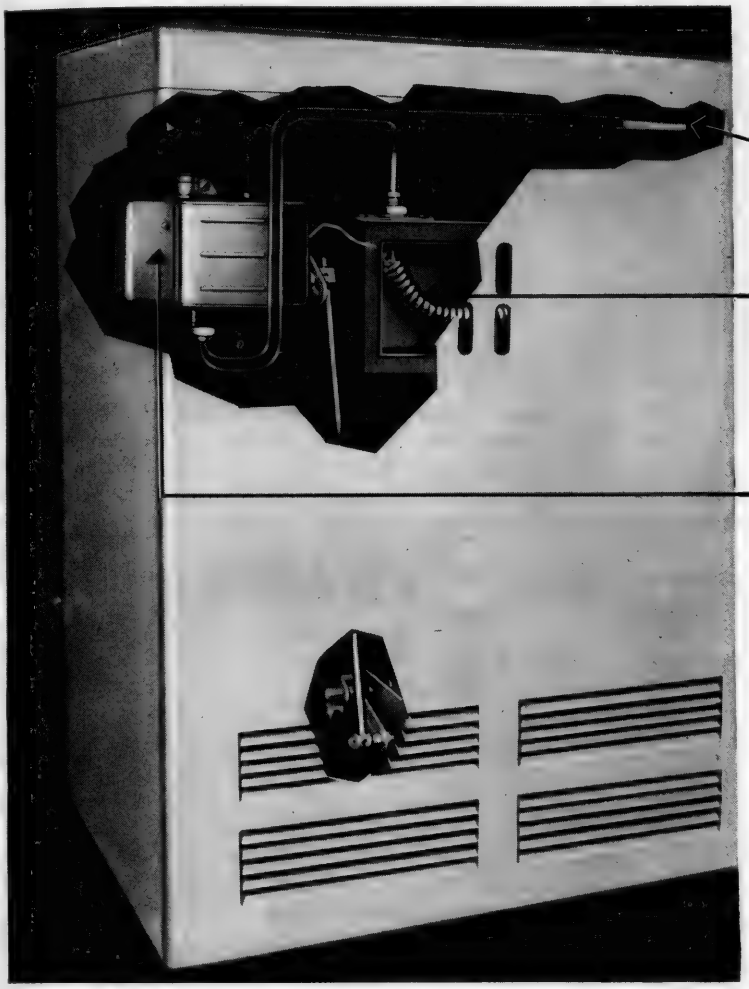
More information? Circle Item 46, postcard, last page.

(Continued on page 98)

THE MARK OF QUALITY

BARBER COLMAN

New unit ventilator control provides greater accuracy, costs less to install!



Temperature sensing bulb in the discharge air stream.

Temperature sensing bulb in the room air sampling chamber.

(Aspirating principle insures exceptionally accurate and responsive control.)

Motor operator, controlled by the integral thermostat, is directly linked to the damper mechanism. This system provides automatically controlled heating and ventilating.

Positive spring return closes the outdoor damper in event of fan shutdown or power interruption.

Dual Element Controller mounts directly on face and bypass units to control heating and ventilating

This new all-electric Barber-Colman control combines the function of thermostat and controller in a single "package." It mounts directly on the unit ventilator, eliminating the need for a wall thermostat and substantially reducing control and installation costs. Factory installation is practical.

As illustrated, the control employs the sampling chamber system available on all face and bypass units. This is the proved aspirating principle used on the most difficult and exacting laboratory and industrial control jobs. As a result, control accuracy is superior to that of most wall thermostats (location of which is ordinarily a compromise).

For complete information on this outstanding cost-reducing improvement in unit ventilator control, ask for new Unit Ventilator Control Application file.

BARBER-COLMAN COMPANY

Dept. G, 1302 Rock Street, Rockford, Illinois

One source . . . one responsibility for *both* air distribution and automatic controls

(Continued from page 96)

Flange Line-Up Pins

Flange line-up pins are offered by C. A. Mathey Machine Works, Inc., Tulsa, Okla., for use with cutting and welding jigs for pipeline fabrication. They are said to be very useful for insuring the alignment of bolt assemblies for correct, accurate joining. Pins fit ¼-inch and 1¾-inch bolt holes.

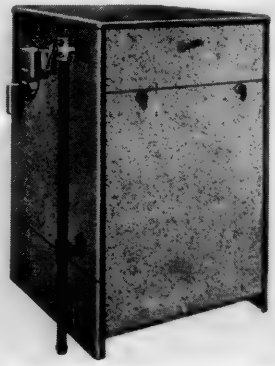
A pair of flange line-up pins are installed in the holes of the flange, as illustrated, to support a spirit level so that the axis of the bolt holes in the flange are perfectly horizontal preparatory to welding the flange to a pipeline or preparatory to piping fabrication. Cones of line-up pins automatically center to pin in any bolt hole, and are designed to fit properly even in raised-face flanges. Price is twenty-five dollars for a set of two.

More information? Circle Item 47, postcard, last page.

Expand Gas Boiler Line

Addition of No. 70 to its Holiday cast iron boiler series is announced by Heating and Cooling Div., Burnham Corp., Irvington, N. Y. Like its No. 60, the company's new model complies with all principal codes: AGA, SUR, I-B-R, and ASME. AGA approval is for manufactured, mixed, or natural gas.

Designed for large residences, apartment houses, and



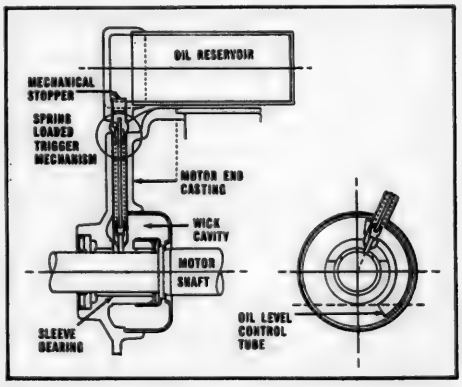
commercial installations, it is produced in eight sizes, in capacities from 600 to 2,700 sq ft for water, and 325 to 1580 sq ft for steam. All-copper, built-in, tankless water heaters are available for both water and steam models which products 4 to 15 gpm. Flue travel is vertical. Heated gases pass over a specially designed heat exchanger surface containing hundreds of heat-absorbing pins, the company states. Flueways are reached easily from the front, without disturbing piping or draft hood.

More information? Circle Item 48, postcard, last page.

Self-Lubricating Motors

A line of electric motors incorporating reservoirs and feed devices which are designed to admit oil to sleeve bearings in controlled quantity after the original bearing lubricant is expended, is offered by Franklin Electric Co., Inc., Bluffton, Ind.

A supply of the proper type lubricant is contained in the visual reservoirs mounted on each motor end bell. Oil is retained in each reservoir by means of a mechanical stopper, permitting normal handling prior to installation without loss of lubricant from reservoir. After a predetermined length of operation time the lubricant is discharged to the bearing cavity. This is accomplished through the use of a wear-stem of controlled-density carbon which rides the motor shaft and begins to wear after a predetermined length of time. The wearing of this stem triggers a spring action release of the mechanical



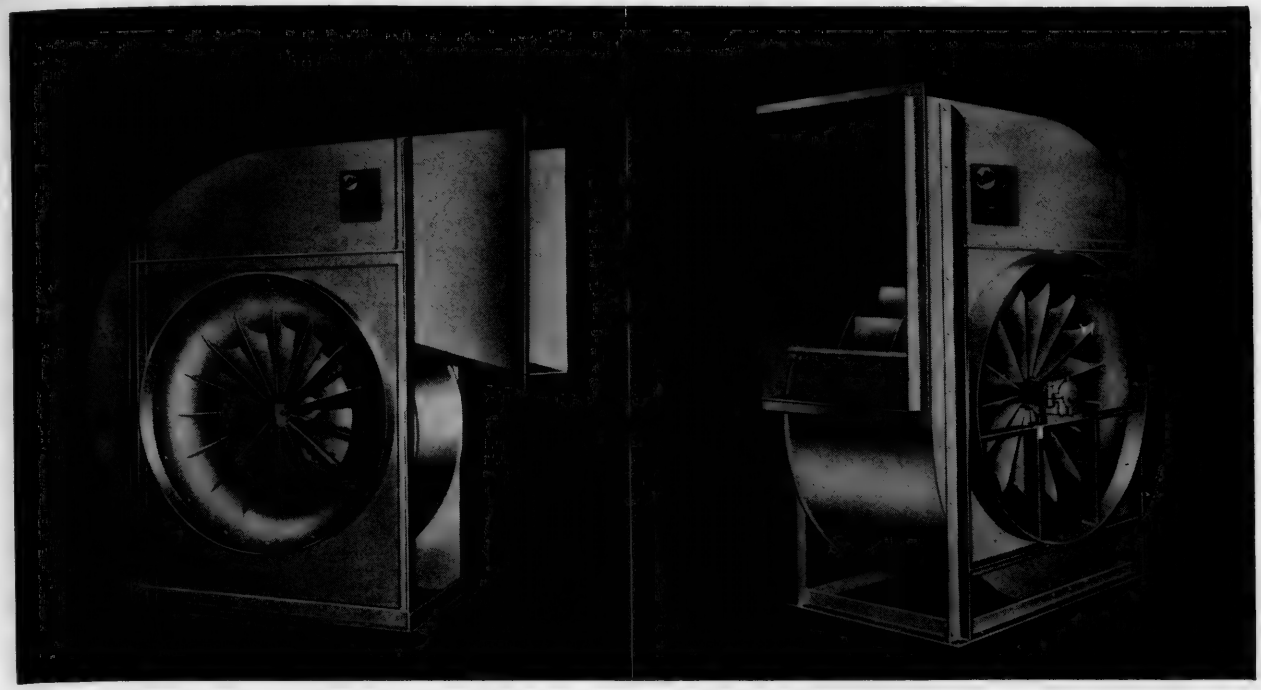
stopper in the oil reservoir, allowing lubricant to enter the bearing wick cavity. Oil level is controlled by a built-in control tube. As oil is used from the wick cavity, it is continually replaced by fresh oil from the reservoir assuring a proper amount of lubricant to the bearing.

All electric motors eventually require lubricant maintenance, the company points out but with typical fractional rating applications, the user usually neglects or overlubricates the motor. Typical of such applications are air conditioners, attic fans, automatic washers, blowers in furnaces, business machines, clothes dryers, freezers, industrial machinery and refrigerators of all types.

Motors are available as standard in ⅓- to 1½-hp ratings in 56-frame construction, dripproof, open, or totally enclosed construction, sleeve bearing equipped, with or without capacitor. Application-engineered specials are offered to manufacturers' requirements in additional ratings and types.

More information? Circle Item 49, postcard, last page.

(Continued on page 100)



For Classes III-IV (High Pressures) The "Buffalo" Type "BLH" Fan

For Classes I-II (Moderate Pressures) The "Buffalo" Type "BL" Fan

FOR THE BEST ENGINEERED JOBS, SPECIFY BUFFALO "JOB-SUITED" FANS

For central system applications you don't have to accept a "compromise fan", loosely designed to cover any and all pressure requirements. "Buffalo" builds *two* fans, each engineered to fulfill specific pressure requirements to the highest possible degree. Brief engineering details on these "no compromise" "Buffalo" Fans are given below.

The "Buffalo" Type "BLH" Fan is recognized by engineers and contractors alike for its outstanding performance in Classes III and IV service. The "BLH" maintains an extremely high mechanical efficiency of 86% over a broad operating range. The smooth inlet bell with matching shroud, directional inlet vanes, backward-curved blades and divergent outlet all contribute to quiet operation and minimum turbulence. "Buffalo" engineering features, plus husky construction, add up to an efficient high pressure fan that will deliver long, faithful, maintenance-free service. When you plan a conduit system or other Class III-IV installation, be sure to specify the "BLH". Call in your "Buffalo" representative or write for Bulletin F-200.

The "Buffalo" Type "BL" Fan has gained wide acceptance for peak performance in major Class I and II installations throughout the country. Non-overloading, the "BL" provides quiet, stable, output from free delivery to shutoff. The smoothly-curved inlet bell, with directional guide vanes and matching shroud, assures minimum turbulence. Highest efficiency is attained by the streamlined wheel with backward curved blades, factory tested and balanced to hold vibration to an absolute minimum. The correctly shaped scroll of the wheel-contoured housing further contributes to smooth air flow. For full information on the rugged, reliable "BL" Fan for Class I and II conditions, contact your "Buffalo" engineering representative. Or, write direct for Bulletin F-104.

You get a *value dividend* with the "Q" Factor — the built-in QUALITY that provides trouble-free satisfaction and long life in *every* "Buffalo" product.

"Buffalo"

BUFFALO FORGE COMPANY • Buffalo, New York

Buffalo Pumps Division, Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

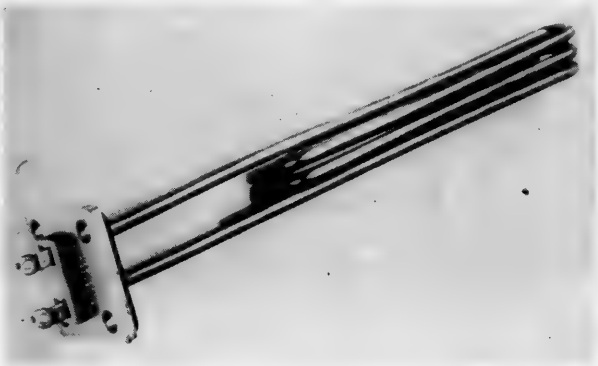
VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

(Continued from page 98)

Water Immersion Heaters

Flanged water immersion heaters for use with new equipment or as replacement units for domestic water heaters; laundry, dairy and laboratory equipment; steam tables and generators; and dishwashers, are announced by Industrial Heating Dept., General Electric Co., Schenectady, N. Y.

Installation of the tubular heaters can be made with four bolts. All-copper construction of the elements provides rust-free durability. The heater head flange is reinforced by a heavy duty steel back-up plate for maximum strength.



Tests show that the water-tight terminals meet water seal requirements and give extra protection and dependability, according to company engineers. Heaters are available in three styles with small or large flange in ratings from 600 to 5,000 watts and from 5-25/32 inches to 15-5/16 inches.

More information? Circle Item 50, postcard, last page.

Magnetic Drill Press

Following the recent introduction of a 1¼-inch magnetic drill press, The Black & Decker Manufacturing Co., Towson, Md., announces a smaller version to meet popular demand. This ¾-inch magnetic drill press offers the same quality, design, and performance features of its top-capacity counterpart with lighter weight and lower cost for smaller capacity work in all types of steel fabrication, construction, and maintenance.

For heavy industrial drilling, this new unit is built to drill holes within 1/64-inch accuracy, in continuous operation, on either a-c or d-c current. The press will not overheat and thereby reduce its magnetic hold after a few hours. Among other features of the press are drill point locator for immediate, exact positioning; two-piece construction for ease of handling; and remote control hydraulic power-feed which enables the operator not only to drill with little effort, but also to stand clear of the work.

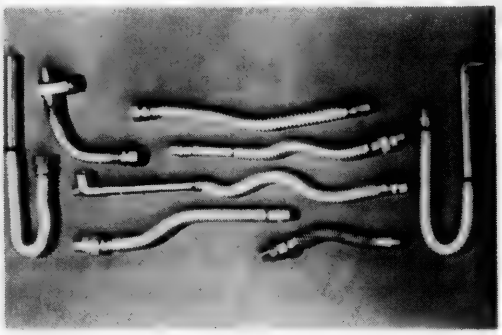
As in the larger model, the magnetic base is detachable from the drilling unit, reducing even more weight from the half that must be supported to secure the unit in position. Exact, firm alignment of the two parts eliminates any possible free play after coupling. In attaching the magnetic base to the work surface, the drill point locator makes it possible to align immediately for accurate drilling of the hole desired. A built-in headlight throws a direct light beam at the center of the hole.

Magnetic contact is controlled by a safety grip trigger switch on the base. Releasing the trigger turns on the magnet instantly, securing it tightly to the metal. For maximum safety when the unit is used in a suspended position, eye bolts are conveniently located on the base for securing with standard equipment safety chain.

More information? Circle Item 51, postcard, last page.

Flexible Metal Connectors

A complete line of flexible metal connectors in ½- and ¾-inch ID is announced by Cobra Metal Hose, Chicago, Ill. Fourteen separate models in 30 combinations for hot water or steam heating systems will supplement the eight models introduced some time ago.



The connector line was developed with the cooperation of independent contractors primarily for reducing the cost of installing wet heat systems and for speeding installation of systems in industrial, residential and commercial buildings. The connectors eliminate many fittings, nipples, and time-consuming assembly operations. Noises are said to be eliminated because flexible connectors absorb the sound; they automatically take up expansion and contraction of lines.

Rafold constructed of high quality bronze metal tubing, connectors can be used at temperatures up to 350 deg F. Recommended working pressures for ½-inch ID is 55 psi; for ¾-inch ID, 40 psi.

More information? Circle Item 52, postcard, last page.

(Continued on page 102)

Complete-line air-conditioning lets Worthington dealers

CUSTOM-QUOTE EVERY JOB!

Probably the most complete line of air conditioning equipment in the world—*Worthington, naturally*—is signing on a select group of new air conditioning dealers—*yourself, possibly?*

Many, many different models permit these *fortunate* dealers to put together the most efficient and economical combinations of air conditioning equipment for any *specific* job. Handling *exactly* the right equipment for every air conditioning problem eliminates equipment compromises, means these *smart* dealers can "custom-quote" on every job. And behind this job-tailored equipment stands 70 years of respected Worthington experience and front-line service. (Incidentally, these same *intelligent* new dealers will find that Worthington equipment is backed by a 5-year warranty which includes a generous dealer labor allowance.)

Interested in quoting on equipment fashioned to the job, not jobs fashioned to the equipment? Interested in increasing your sales, cutting down on lost orders? If so, *Worthington wants you—and you'll want Worthington.* Write today for the complete air conditioning story. Worthington Corporation, Air Conditioning and Refrigeration Division, Section 12-4, Harrison, N. J.

WORTHINGTON

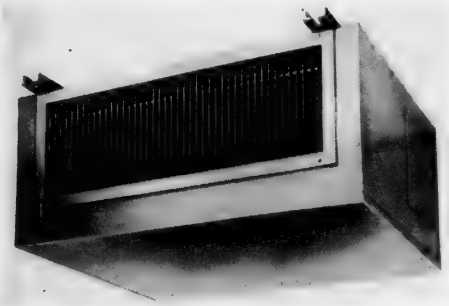
WORTHINGTON'S COMPLETE COMMERCIAL AND INDUSTRIAL AIR CONDITIONING LINE INCLUDES:

Flexi-cool line: Air-cooled, ceiling-mounted, split systems • Water-cooled, self-contained, ceiling-mounted units • Smallest floor-mounted unit available • Hang it, lay it down, stand it up • Vertical and Horizontal cooling coils • Remote water-cooled packaged unit • Water-cooled self-contained packaged unit • Air-cooled packaged units • Air-cooled condensers • Air-cooled condensing units • Packaged water-chillers — hermetic and open • Reciprocating compressors • Air handling units • Evaporative coolers • Evaporative condensers • Fan and coil units

(Continued from page 100)

Cabinet, Concealed Room Units

A series of cabinet and concealed type room unit air conditioners is introduced in eight versions by A. H. Witt Co., Inc., Los Angeles, Calif. The Zone Air line ranges from 1½ to 10 tons, and is recommended for motels, stores, and hospitals.

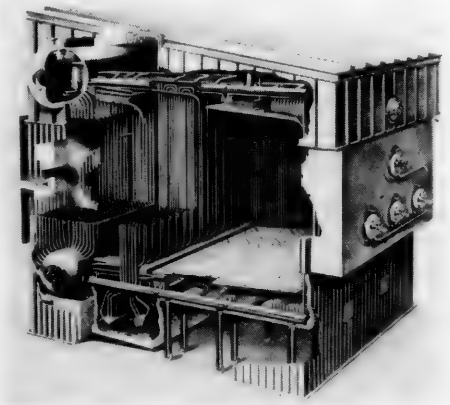


Particular attention has been given to the cabinet design of the line in order to create an acceptance in the most elaborate surroundings, the company states. Like their concealed type counterparts, cabinet units are designed for direct expansion, hot or cold water, or direct expansion and water. No duct work or tearing out partitions for installation purposes is required.

More information? Circle Item 53, postcard, last page.

Oil-Gas Fired Steam Generator

The PFI (Power for Industry) boiler, an oil, gas, or oil and gas fired, pressurized-furnace steam generator is announced by The Babcock & Wilcox Co., New York, N. Y. Available for steam to 1150 psi, and for superheated steam to 900 deg F, it is said to require less space than previous designs, to be easy to install, to be able to meet rapid and wide load swings, and to operate for long periods without maintenance. The generator is designed for power, process, or heating loads requiring steam capacities to 400,000 lb per hr.



Pressurized-furnace design eliminates the need for an induced draft fan. The result is high firing efficiency and savings in fan and power costs, the company states. The design also eliminates the need for all internal closure refractory, thus eliminating another maintenance item. Membrane Wall, the company's prefabricated furnace construction, utilizes welded tubular furnace wall panels, and its cyclone steam separators insure that only steam-free water is recirculated, the result being a maximum circulating heat at all ratings and protection of boiler tubes against overheating and burnout.

More information? Circle Item 54, postcard, last page.

Improved Sediment Interceptors

Introduction of improved sediment interceptors for use on pump suction for swimming pools, filters, water softeners, bleaching tanks, and similar water supply systems; and waste lines from mechanical laundry equipment, is announced by Josam Mfg. Co., Michigan City. Ind. Known as Series H-70 and H-80, they intercept hair, lint, sand, metal objects, gravel, and similar sediment, preventing equipment from clogging. They are suitable for installation on pipe standards or hung with piping, the company states.

The pressure-tight units have cylindrical bodies said to withstand greater suction pressures than square or rectangular bodies. Protective leak-proof cover has swing bolt locking arrangement for convenient emptying of sediment basket, but cover cannot be replaced until basket is in place. Units are available in sizes to 10-inch connection, threaded or flanged.

More information? Circle Item 55, postcard, last page.

Expands Condenser Line

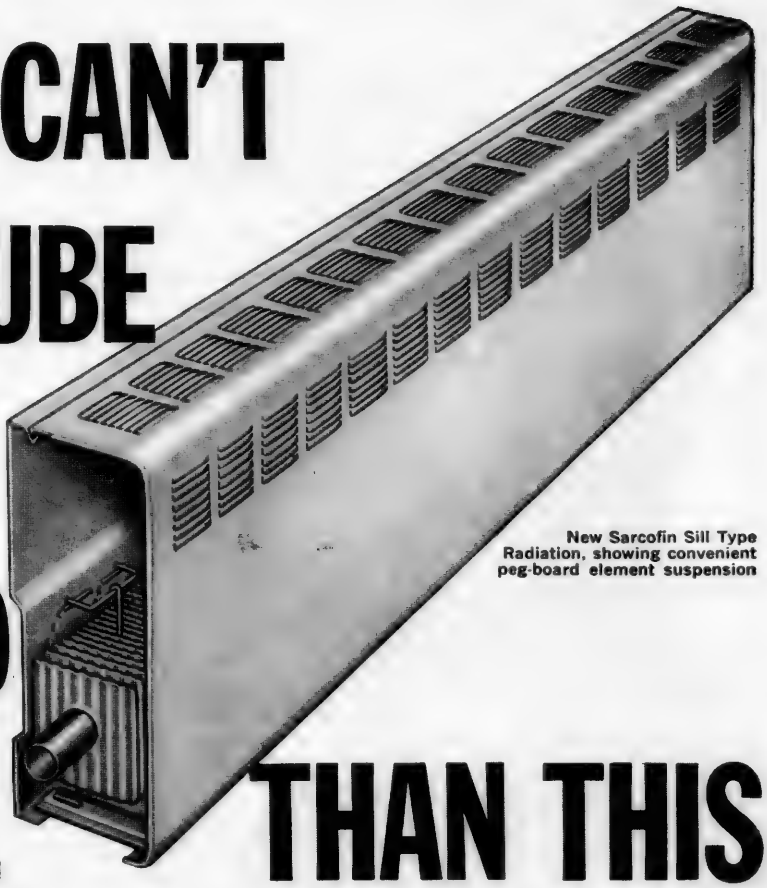
Expansion of its line of ACC Series-2000 air-cooled condensers to include 10, 15, 20, and 25-ton sizes is announced by Air Conditioning and Refrigeration Div., Drayer-Hanson, a division of National-U.S. Radiator Corp., Los Angeles, Calif. By duplexing, larger tonnages are obtainable.

The equipment is described as a problem-solver for applications where water is in short supply. Units operate on the draw-through principle, said to assure full, uniform use of the coil and an easy cleaning operation of finned surfaces. They are self-contained, remote types for ceiling or wall suspension, indoor or outdoor. Belt drive permits reducing fan speed to control noise.

More information? Circle Item 56, postcard, last page.

(Continued on page 104)

YOU JUST CAN'T FIND FINTUBE THAT'S EASIER TO INSTALL THAN THIS NEW SARCOFIN SILL TYPE RADIATION



New Sarcofin Sill Type Radiation, showing convenient peg-board element suspension

This new Sarcofin Custom Built Sill Type Radiation puts three important assets in your hands: high heating efficiency, great flexibility of application, and extreme ease of installation. The 16-gage steel cabinet is reinforced with strong, vertical supports welded at close intervals to the inside of enclosure to lend strength and rigidity to the entire assembly.

Rounded contours and precision flanges give smooth assembly, completely free of splicing plates and unsightly bolts. Peg-board element suspension means easy, fast mounting with end-to-end rigidity. Ample allowance for expansion and contraction.

Write for helpful Bulletins giving radiation data, pressure and temperature correction factors, and unit dimensions. Ask for:

No. 1660—Sarcofin Sill Type Radiation

No. 1650—Finned-Tube Commercial Radiation

No. 1640—Finned-Tube Baseboard Radiation

SARCO COMPANY, INC. • SARCOTHERM CONTROLS, INC.

635 Madison Avenue, New York 22, N. Y.

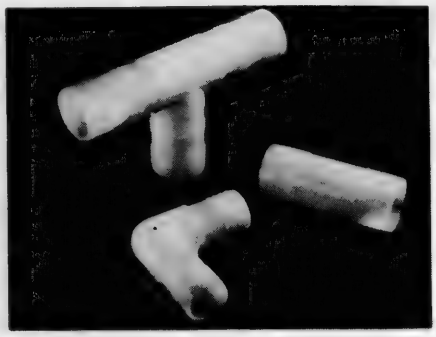
6151-B

(Continued from page 102)

Nylon Pipe Fittings

Nylon fittings for plastic pipe are manufactured by Plastiline, Inc., White Plains, N. Y. The insert-type fittings: adapters, couplings, tees, and elbows, are available in sizes ranging from ½ to 2 inches.

The high tensile strength and impact resistance imparted to the fittings by the Plaskon Nylon 8200 of



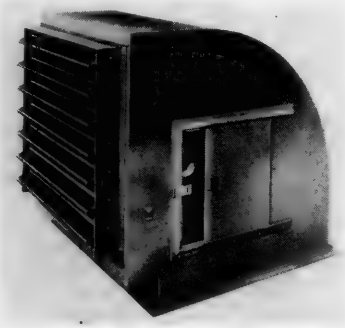
which they are molded, the manufacturer states, protects against the considerable abuse encountered in both installation and use. In addition, corrosion resistance is said to be superior to that of conventional metal fittings while cost, in many cases, is lower.

Uses for the flexible piping incorporating the Nylon fittings include jet well installations, industrial piping, and air conditioning. Systems utilizing the units also find application in the watering of livestock, golf courses and lawns, and ice skating rinks.

More information? Circle Item 57, postcard, last page.

Penthouse Ventilators

A line of completely assembled, ready-to-install penthouse ventilators, said to be engineered and designed to very low audio specifications for extremely quiet operation, is announced by Power Line Fan Co., Plainfield, N. J. Designated Types DRP and BRP, these ventilators are suited for use in all general ventilating systems where large volumes of air must be moved at low static pressures.



To meet extreme climatic conditions, a special insulation is available that prevents condensation within the penthouse, saves heat during winter months, and promotes quietness of operation. Another feature is the large front overhang with a built-in water bypass tray that collects and channels back to the roof any excess rainwater that may pass through the louver during a very heavy storm.

Ventilators are available in direct or belt-driven models to answer any general ventilation requirement. Both units are constructed of heavy gage steel, and utilize ball-bearings throughout. The DRP direct drive units, with totally enclosed motors, are especially adaptable to inaccessible locations. Low-speed, belt-drive BRP units are recommended where extra-quiet operation is desired. Both types are also available with non-overloading type fans for operation at moderate static pressure.

More information? Circle Item 58, postcard, last page.

Indicating Controller

Primarily for temperature or pressure control, a new indicating controller, called the USG Pilot, is available from U. S. Gauge Div., American Machine and Metals, Inc., Sellersville, Pa. The unit is specifically designed to meet industry's needs for a compact, low-cost pneumatic controller. Yet it can provide not only two-position control but also wide band proportioning with or without automatic reset or rate action — refinements generally associated with higher-priced controllers, the company states.

Measuring 8½ inches square by 4 inches deep the

controller can be surface-mounted on equipment, or flush-mounted on instrument panelboards. It can also be mounted directly on the pneumatic-operated valve that it positions. Indication of measured variable is made on a 3½-inch precision gage dial (6¾-inch scale length). A red circle-tipped pointer also indicates the knob-adjusted set point on this same dial.

Modes of pneumatic control offered are: (1) two-position with differential gap, adjustable from 1 to 100%; (2) proportional control, adjustable 1 to 100% (1 to 150% available); and (3) proportional control (1 to 150%) plus automatic reset or rate action. Controller design permits easy change from one mode to another after unit is installed.

To suit specific needs in a given application, the same controller can be simply altered to provide "direct action" (increase in output pressure with increase in measured variable) or "reverse action" (decrease in output pressure with increase in measured variable).

More information? Circle Item 59, postcard, last page.

(Continued on page 106)

Do you have your copy?

It's Bethlehem's new Handbook, completely revised to include specification data on both electric resistance-weld steel pipe and continuous butt-weld pipe. Line Pipe, Standard Weight Pipe, Drive Pipe, Water Well Casing—it's all here and more, plus abstracts from Specifications ASTM A 120-54 and ASTM A 53-55 T.

For *usable* data on steel pipe manufactured on the finest equipment and with the utmost skill and processing know-how, send for your copy of Bethlehem's up-to-the-minute Handbook. Just clip the coupon.

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Please send me your newly revised *Handbook of Tubular Products* (No. 393-B) which contains specification data on electric resistance-weld and continuous butt-weld steel pipe.

*Name*_____

*Title*_____ *Company*_____

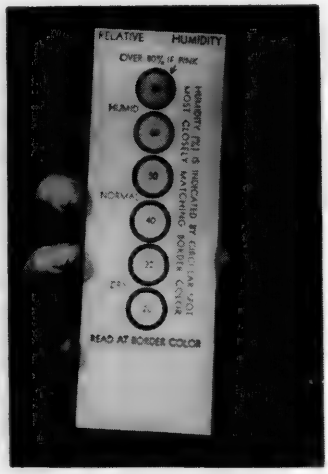
*Address*_____

*City*_____ *Zone*_____ *State*_____

(Continued from page 104)

Humidity Indicator

The Humigraph is a humidity indicating card 2 by 6¾ inches in size with seven indicator spots whose color changes from blue to pink as relative humidity of the ambient air changes. Offered by Andrew Technical Supply Co., Chicago, Ill., it reads from 10% to 80% relative humidity. It takes 5 to 10 min for the card to respond to small changes, about 30 min for changes in the order of 40%. Some have been in continuous use for over two years.



A package of five cards cost one dollar, and quantity orders can be had at lower cost. Therefore, they may be used in many applications where more precise and durable instruments would not be feasible. In addition to their use in plants, laboratories, etc., they are recommended as promotional items, on which special scalings and imprints are printed.

More information? Circle Item 60, postcard, last page.

Ventilator-Skylight

The Conso roof ventilator is a combination skylight and roof ventilator. Fiberglas-reinforced polyester plastic hood has a translucent dome that passes about two-thirds of the outside light, flooding the interior of a building with a soft and diffused light, according to the manufacturer, Consolidated General Products Inc., Houston, Tex.

Hood is shatterproof, corrosion resistant. Entire unit weighs about 50% of all-steel unit, making installation easier. Low silhouette is architecturally desirable.

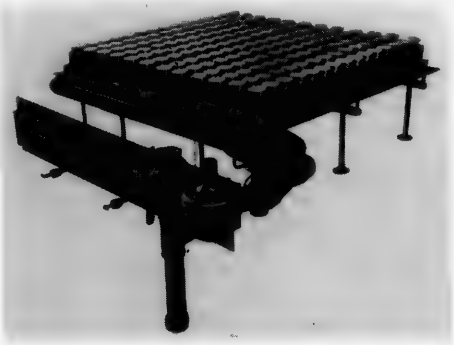
Fan is sheathed in galvanized housing. Electric motor is protected by overload switch. Counter-balanced, gravity-operated louvers beneath the plastic hood control air flow and are fitted with nylon bearings to prevent rattle.

Ventilators come in 18 stock sizes, fitted with fans measuring 2 to 4 ft in diameter. Hoods range in size from 45 to 80.5 inches square. Units weigh from 127 to 335 lb complete. Prices start at about two hundred and seventy dollars.

More information? Circle Item 61, postcard, last page.

Ceramic-Head Gas Burners

Addition of vertical-flame, ceramic-head gas burners to its line is announced by Power-Flame Division, Inc., Grandview, Mo. Known as Series U-400 Thoro-Mix, their



design eliminates metal parts in the heat zone. They can be operated at any pressure above one inch of water without flashback, the company states, and are available in a range of sizes from 200,000 to 12,000,000 Btu per hr.

More information? Circle Item 62, postcard, last page.

Dehydrators

A dissipating chemical type dehydration unit which makes possible dew points of minus 150 deg F and 5-micron filtration of air, gas or liquids, is introduced by Dehydrators, Inc., Tulsa, Okla.

According to the manufacturer, the dehydrators will remove 1 lb of water for as little as seven cents. The line ranges in size from 2 to 8 inches dia, said to be much smaller than others designed to perform a comparable service.

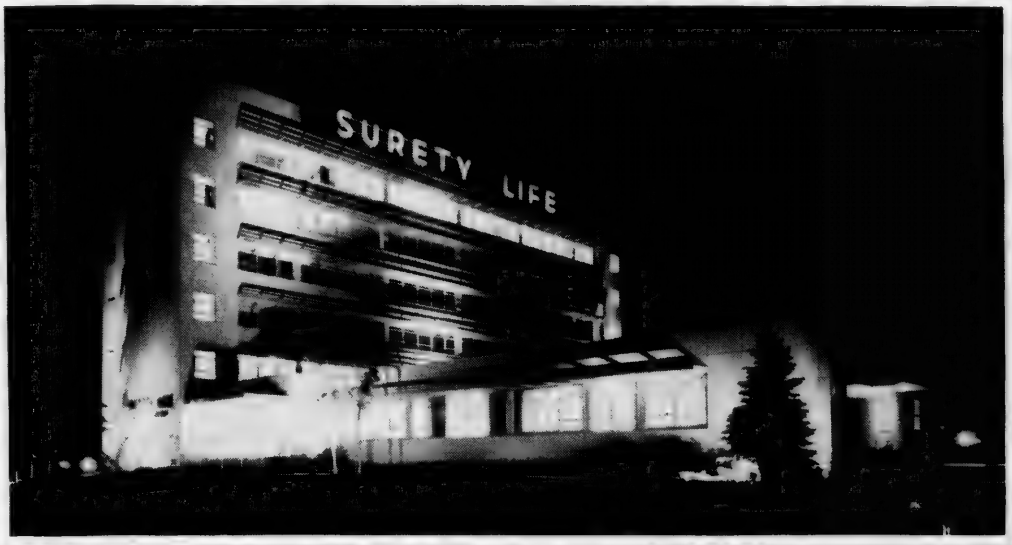
The key to the dehydrator's operation is its compensating cartridge. A water-soluble desiccant in the cartridge is under constant spring compression. As this chemical dissipates on water contact, the spring adjusts toward the point of contact, eliminating voids and fissures; the troubles said to have traditionally plagued previous designs of dissipating chemical dehydrators.

The manufacturer suggests this line of dehydrators as an economical solution to the problem of the elimination of freezing and corroding in air-operated equipment such as: intermitter valves on oil wells, control valves, gas engines, fuel gas on package process units, orifice meters, and consumer propane tanks. The unit is also recommended for plant air systems, process streams, and for air compressors and air tools.

More information? Circle Item 63, postcard, last page.

(Concluded on page 108)

CASE #102—Another case where General Electric Factory-Assembled Air Conditioning Units proved more practical than a field-assembled system.



Air conditioned by Refrigeration [illegible]

The striking modern lines of the new Surety Life Building, Salt Lake City, Utah, pay tribute to the taste and skill of the architects. And the economical, Zone-by-Zone installation of General Electric Air Conditioning pays tribute to their judgement.

GENERAL ELECTRIC ZONE-BY-ZONE AIR CONDITIONING

meets all economy and performance expectations of architects in new Salt Lake City building

Beauty and function go hand in hand—with an incomparable degree of *comfort*—in Salt Lake City's new Surety Life Building. The architects chose a system of air conditioning as modern and effective as the architecture itself:—General Electric Zone-by-Zone Air Conditioning. Here's what Mr. Slack W. Winburn, architect-engineer, has to say about it...

"The General Electric Air Conditioners specified by us have proved highly satisfactory in the Surety Life Building. The points entering into our decision to specify General Electric Zone-by-Zone Air Conditioning offered the following benefits:

"1. Lower first cost, together with lower operating costs.

"2. Three zones of control per floor provide flexibility of control in the northern, central, and southern areas, thereby affording proper temperature control regardless of solar exposure, occupancy, or outside temperature.

"3. With the Zone-by-Zone conditioning approach, the large and long supply ducts normally used in a central-plant system were eliminated.

"4. The system allowed a layout of duct distribution between floors and the placing of diffusers and lights to a module between window mullions. This enables partitions to be moved without tearing into ceilings to make changes.

"5. One important consideration was the easily removable, sealed refrigeration units which can be replaced quickly if repairs are necessary."

We can add little to Mr. Winburn's words except, perhaps, to note that this case is typical of the results you can expect when you install General Electric Zone-by-Zone Air Conditioning.

General Electric's complete line is flexible enough to meet every air conditioning need for all types of buildings—large or small, old or new. Ceiling-mounted units, water-cooled, up to 7½ tons—air-cooled up to 10 tons. Floor-mounted units—water-cooled—up to 30 tons—air-cooled up to 20 tons. Steam and hot water coils available for all models. Discover how General Electric Factory-Assembled Units can simplify your job. For full details write: General Electric Company, Air Conditioning Department, 5 Lawrence Street, Bloomfield, New Jersey.

Progress Is Our Most Important Product

GENERAL ELECTRIC

In Canada, Canadian General Electric Co., Ltd., Montreal

(Concluded from page 106)

Multi-Station Showers

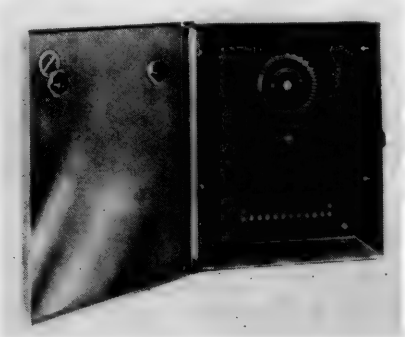
Showergon, Arvin type, Series 7600, is a surface mounted stainless steel shower component, factory tested, ready for installation with chain-like simplicity, offered by Logan Mfg. Co., Glendale, Calif., in multiples of one, two, three, or four shower stations. Overlay connections, access panels, and right angle corner units provide adequate stock fixture combinations to meet most shower room requirements, the company states.

Design represents all of the many architectural advantages of concealed piping while retaining the accessibility normally found only in exposed piping installations. All interior portions are produced from stainless steel, brass, or copper. All exposed brass fixtures, such as shower heads, valves, and soap dispensers, are triple plated chrome finish and assembled with vandal-proof stainless steel screws. Fourteen-gage stainless steel housing with a No. 4 commercial finish provides surfaces easy to clean and resistant to corrosion.

More information? Circle Item 64, postcard, last page.

Master Heating Control

A master heating control combining an inside program time switch and an outdoor weather head, made by Heating Controls Div., Tork Time Controls, Inc., Mount Vernon, N. Y., is said to provide optimum regulation of heating in any building—multiple family dwellings, office and factory buildings, and institutions—using automatic gas, oil, or coal firing.



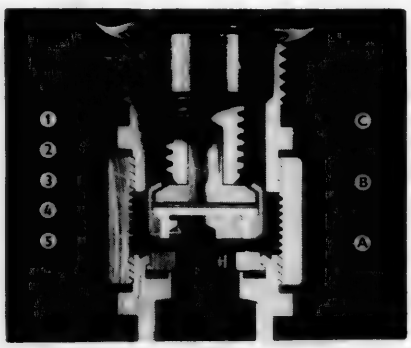
Called the Tork Weather Control, unit provides uniform, comfortable building temperatures with a minimum of boiler room attention. It times heat to the weather and synchronizes heat output to the actual demands of the weather. All waste caused by supplying more heat than necessary is eliminated. Heat is cycled on the inside control panel (illustrated) according to outdoor temperature and indoor building satisfaction; the control starts and stops the heating plant at preselected intervals as programmed on the 24-hr dial. Setting of the cycle tabs and limit control assures rapid morning pick-up and heat throughout the system until shutdown. Once set, the controls need no further adjustment. Panel signal lights constantly indicate proper and current operation to attendants.

For summer use, the *off* position allows the system to provide hot water without building heating. An omitting device, for automatically skipping operation on days when building may be closed, is optional equipment. The unit, for line voltage only, is available in both 115 volt, 60 cycle and 208-230 volt, 60 cycle models.

More information? Circle Item 65, postcard, last page.

Drip-Free Faucet

What is claimed to be the first absolutely drip-free faucet, guaranteed to serve at least 25 years without repacking, was demonstrated in Stockholm, Sweden, recently. Invented by Baltzar von Platen, a co-inventor of the Electrolux absorption refrigerator, in collaboration with AB Ifoverken, one of Sweden's leading manufacturers of sanitary china and porcelain, the valve is based on the principle that sand and other solid particles in the tap water should be repelled by the rubber packing, and also that the force required to turn the faucet should be the least possible.



As illustrated, the valve consists of the seating (A), the cone (B), and the spindle (C). Figures indicate piston (1), cylinder (2), sliding disc (3), the packing (4), and the nucleus (5).

When the faucet is turned for closing, the cylinder and nucleus come into contact with the seating. With further turning of the faucet, the resulting pressure on the rubber packing presses the cylinder and nucleus steadily on to the seating. The only play that might arise between the cylinder and nucleus on one side and the seating on the other is the unevenness of the steel surfaces, but this play is eliminated by the rubber between the cylinder wall and the nucleus which, in its state of compression, is pressed against the seating and thus seals the valve effectively.

ARCHITECTS and ENGINEERS: Skidmore, Owings & Merrill
GENERAL CONTRACTORS: Chell and Anderson
HEATING and PROCESS PIPING: Wm. A. Pope Co.
AIR CONDITIONING and VENTILATION: Cicero Sheet Metal Co.

Efficient Manufacture Employee Well-being

both aided by Clarage "air" in new Avon cosmetics plant

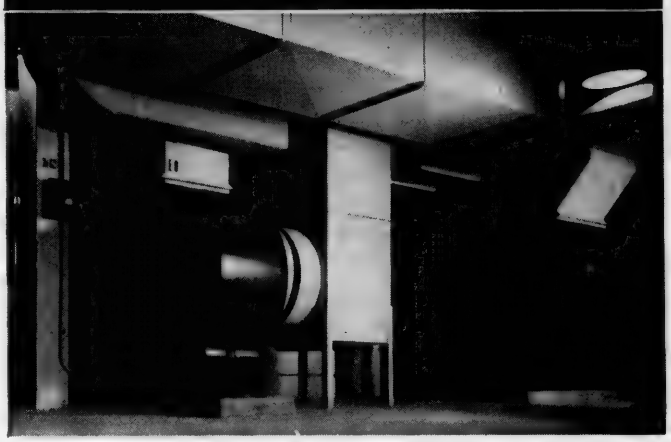
Here is much more than a thoroughly modern manufacturing facility. Here is a national sales center as well.

It's the new Avon Products, Inc., plant at Morton Grove, Illinois. From it flow the widely popular Avon cosmetic products. To it come members of Avon's door-to-door sales organization for training and sales meetings.

Air conditioning, thus, has a dual role to play in this structure — for employee comfort and for efficient manufacturing processes.

As for so many other noteworthy buildings, Clarage equipment was selected — some of which is shown on the right. On the job are Clarage Ready Unit ventilating sets, system fans, and Multitherm air conditioning units, including the famous Blow-Thru units pioneered and perfected by Clarage for multi-zone service.

You, too, will find it profitable to specify Clarage for your next assignments — no matter how large, how small. CLARAGE FAN COMPANY, Kalamazoo, Michigan.



CLARAGE ... *dependable equipment for making air your servant*

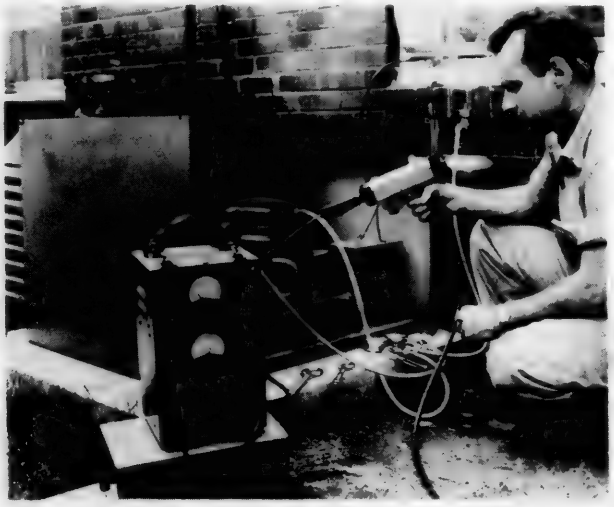
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Portable Leak Detector Speeds Air Conditioner Servicing

Use of a portable leak detector in servicing air conditioners has permitted Jordan Service Co., Louisville, Ky., to reduce to five minutes an operation which formerly took an hour. John M. Jordan, proprietor, said that during the six months repair season the detector makes it possible to service 30% more units.



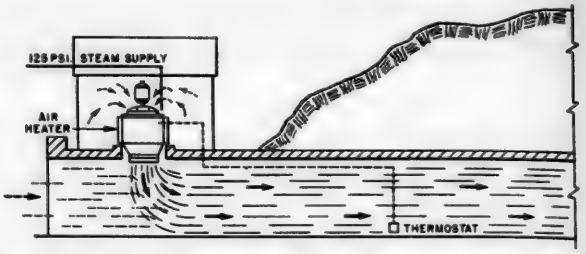
Developed by General Electric's Instrument Department, West Lynn, Mass., the Type H-1 detector is so sensitive it can detect a leak which has a gas escapeage of only 1/100-ounce per year on its most sensitive range.

The portable detector is designed to spot leaks in hermetically sealed refrigerators, air conditioners and similar equipment that use halogen compound gases as refrigerants. Leaks are indicated by an adjustable-volume loudspeaker, as well as by instrument indication on a control panel, as shown in illustration.

Air Heater Prevents Freezing In Mine Tunnel

Ordinarily fresh air supply heaters are found suspended from ceilings in factories, auditoriums, and other buildings above ground. Recently L. J. Wing Manufacturing Co., Linden, N. J., installed a fresh air heater in a mine to prevent freezing of the ground in a haulage tunnel. Sub-zero temperatures had caused rails of the underground railroad to buckle and heave.

The air heater was installed near the entrance to the tunnel as shown in diagram. An existing ventilating fan pulls outside air into the tunnel at the rate of 30,000 cfm. Coils in the unit heated by 125 psi steam raise the temperature of the incoming air to 40 deg F. The ventilating fan then pulls the warmed air 1200 ft into the tunnel. A thermostat downstream from the heater controls the



temperature through a throttle valve in the steam line. The air heater was found to be more satisfactory than laying steam lines under the tracks.

Incombustible Insulation Board Used in Duct Fabrication

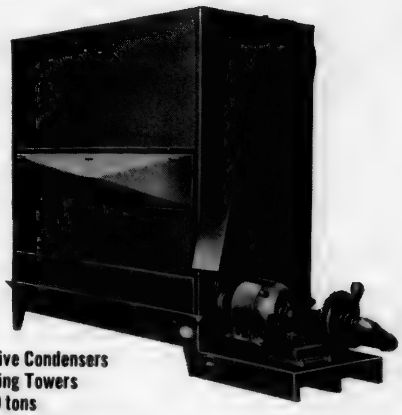
A new material, with an unusual combination of properties and characteristics, is being used extensively in the fabrication of ventilating, exhaust and heating ducts by Asbestos Duct Constructors, Chicago, Ill.

The material, called Asbestolux, was selected for duct fabrication primarily because of its ease of handling, workability and durability. It is an incombustible insulation board, only recently made available to U. S. users by North American Asbestos Corp., Chicago. Comparable in cost to common forms of cement asbestos board, it is said to be as workable as wood and very light in weight. Resistance to temperatures up to 2300 deg F also makes it a prime material for high temperature ductwork.

Depending upon the application, the fabricators use ¼ or ⅜-inch thick Asbestolux. The board is shipped in crated packages containing 4 by 8-ft sheets. Sides of ducts are cut to specified size by using a regular power saw. Steel angle brackets are screwed into the cut pieces to hold the sides together. Pre-drilling is unnecessary. Protection of the brackets and joint reinforcement are provided by the application of asbestos cement.

"Use of this material has eliminated breakage; in-transit, during fabrication, while being installed, or under the most severe service conditions," said Edward De Camp, owner of the ductwork firm which so far has equipped a major Chicago hospital, two nationally-known laboratories, and a leading chemical firm with installations of the new ducts.

You can count on HIGHER PROFITS WITH Curtis AIR CONDITIONERS



Evaporative Condensers
and Cooling Towers
up to 100 tons
Air handling units to match.

Packaged Liquid Chillers—
7½ to 100 tons—F-12 or F-22.
With room console units to provide
controlled cooling and heating
without duct work.

HERE'S WHY...

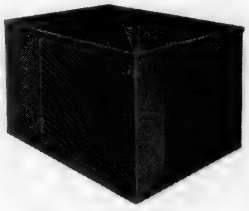
MAXIMUM DEPENDABILITY
Each CURTIS unit is backed by 104 years of engineering and manufacturing experience... one of many reasons why CURTIS air conditioning equipment operates at maximum efficiency with a minimum of maintenance.

CUSTOMER SATISFACTION
The long operational life and minimum service requirements of CURTIS air conditioning, combined with peak performance, assures satisfied customers.

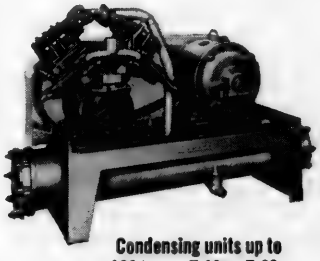
PRE-SOLD PROSPECTS
National advertising beamed at virtually every prospect category helps *pre-sell* Curtis equipment for you. CURTIS provides sales and promotional aids to make your selling job *easier*.

PRICED FOR PROFITS
All Curtis air conditioning equipment is *competitively* priced, with a very generous profit margin *for you!*

Packaged
air conditioning
units—
3 through
50 tons.



Packaged Air Cooled Air
Conditioning Units—2
through 7½ tons. Residential
and commercial applications.



Condensing units up to
100 tons—F-12 or F-22.

REMEMBER—
you can count on **Curtis**

OUR 104th YEAR
MANUFACTURING COMPANY • REFRIGERATION DIVISION
1999 Kienlen Ave., St. Louis 20, Mo.
Represented in Canada by — T. M. Hall Ltd., 30 Milner St., Montreal West 28, P. Q., Canada C-35

DEGREE-DAYS FOR MAY, 1958

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 30th Year of Publication of Monthly Degree-Day Data

City	May			Season to May 31, incl., from Sept. 1		
	1958	1957	Normal	1957-58	1956-57	Normal
Abilene, Texas (A)	16	36	0	3052	2409	2707
Albany, New York (A)	322	264	246	6578	6721	6888
Albuquerque, New Mexico (A)	24	123	70	4396	4012	4389
Alpena, Michigan (C)	462	452	437	7527	7673	7803
Asheville, North Carolina (C)	70	60	105	4726	3521	4067
Atlanta, Georgia (A)	20	31	20	3285	2209	2826
Atlantic City, New Jersey (C)	221	173	189	4746	4393	4717
Augusta, Georgia (A)	19	39	0	2936	1955	2138
Baltimore, Maryland (C)	46	64	73	4030	3735	4203
Billings, Montana (A)	105	275	304	6237	7030	6959
Binghamton, New York (C)	301	267	240	6483	6145	6472
Birmingham, Alabama (A)	25	31	30	3258	2186	2788
Bismarck, North Dakota (A)	204	307	355	8030	8707	8851
Block Island, Rhode Island (A)	394	307	335	5411	5430	5720
Boise, Idaho (A)	119	224	249	5362	6088	5798
Boston, Massachusetts (A)	262	201	236	5356	5548	5742
Buffalo, New York (A)	343	321	315	6497	6187	6720
Burlington, Iowa (A)	109	160	179	6236	5814	6067
Burlington, Vermont (A)	405	350	307	7367	7509	7727
Cairo, Illinois (C)	48	37	47	4168	3425	3756
Charleston, South Carolina (C)	10	14	0	2338	1450	1769
Charlotte, North Carolina (A)	38	35	29	3622	2610	3205
Chattanooga, Tennessee (A)	40	37	45	3903	2782	3384
Cheyenne, Wyoming (A)	255	519	462	7028	7096	7317
Chicago, Illinois (C)[b]	149	284	229	6053	(a)	6252
Cincinnati, Ohio (C)	67	91	108	4708	4012	4532
Cleveland, Ohio (A)	218	221	223	5886	5553	5950
Columbia, Missouri (A)	72	88	135	5299	4506	5093
Columbia, South Carolina (A)	19	31	0	3025	2020	2284
Columbus, Ohio (C)	107	129	153	5399	4805	5255
Concord, New Hampshire (A)	386	284	316	6753	7221	7462
Concordia, Kansas (C)	67	138	146	5544	5186	5303
Dallas, Texas (A)	6	17	0	2590	2225	2272
Dayton, Ohio (A)	148	153	179	5825	5190	5552
Denver, Colorado (A)	138	333	286	5666	5785	6051
Des Moines, Iowa (A)	98	179	201	6512	6156	6384
Detroit, Michigan (A)	228	281	251	6150	6015	6336
Devils Lake, North Dakota (C)	288	335	394	8778	9496	9695
Dodge City, Kansas (A)	67	148	135	5313	4952	5043
Dubuque, Iowa (A)	183	285	267	7154	6915	7159
Duluth, Minnesota (C)	474	475	487	8944	9517	9217
Elkins, West Virginia (A)	233	172	224	6286	5128	5680
El Paso, Texas (A)	3	19	0	2761	2229	2641
Ely, Nevada (A)	332	535	418	7253	7344	7177
Escanaba, Michigan (C)	483	443	471	7869	8138	8334
Evansville, Indiana (A)	77	82	90	4946	4185	4354
Fargo, North Dakota (A)	237	286	338	8074	8728	9107
Fort Smith, Arkansas (A)	27	16	24	3564	3057	3188
Fort Wayne, Indiana (A)	206	209	226	6277	5900	6217
Fort Worth, Texas (A)	9	21	5	2806	2377	2361
Fresno, California (A)	18	64	43	2549	2650	2532
Galveston, Texas (C)	0	2	0	1382	749	1211
Grand Junction, Colorado (A)	84	252	145	5371	6022	5773
Grand Rapids, Michigan (A)	252	300	301	6775	6447	6948
Green Bay, Wisconsin (A)	366	385	347	7823	7938	8062
Greensboro, North Carolina (A)	57	48	50	4321	3403	3810
Greenville, South Carolina (A)	30	28	32	3650	2669	3060
Harrisburg, Pennsylvania (A)	148	137	128	5337	5007	5244
Hartford, Connecticut (A)	281	228	201	5960	6162	6094
Hatteras, North Carolina (C)	(a)	(a)	25	(a)	(a)	2392
Havre, Montana (C)	133	220	313	7223	7948	8030
Helena, Montana (A)	167	302	399	7137	7994	8005
Houston, Texas (C)	0	0	0	1493	892	1276
Huron, South Dakota (A)	164	204	279	7274	7597	7796
Indianapolis, Indiana (A)	141	131	176	5824	5108	5581
Jackson, Mississippi (A)	16	24	0	2839	1902	2202
Kansas City, Missouri (A)	52	69	111	5006	4562	4880
Knoxville, Tennessee (A)	53	33	50	4012	2895	3590
La Crosse, Wisconsin (A)	152	254	250	7113	7080	7545
Lander, Wyoming (A)	230	414	396	7343	7485	8110
Lewiston, Maine (O)	429	308	344	6957	7337	7662

(a) Data not available. [b] 1958 and normal figures are for Midway Airport; 1957 figures are for Grant Park Station.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively. [Table concluded on page 114]

Designer:
Maria Bergson Associates

STRIPLINE

Distinctive SLOT TYPE Diffusers

Look around . . . you'll see STRIPLINE by AGITAIR everywhere. And no wonder. STRIPLINE combines the best features of both slots and efficient air diffusers to provide equalized air flow throughout its entire length.

Slender, inconspicuous, practical and versatile . . . STRIPLINE slot diffusers can be located in walls, ceilings, coves, moulds, window reveals, stools... yes anywhere to suit interior design.

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high velocity units • punkah louvers
air diffusers • filters • exhausters

Sold exclusively by representatives for:

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

Write for Complete Stripline Catalog

Type H Stripline shown in above installation

Degree-Days for May, 1958 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 30th Year of Publication of Monthly Degree-Day Data

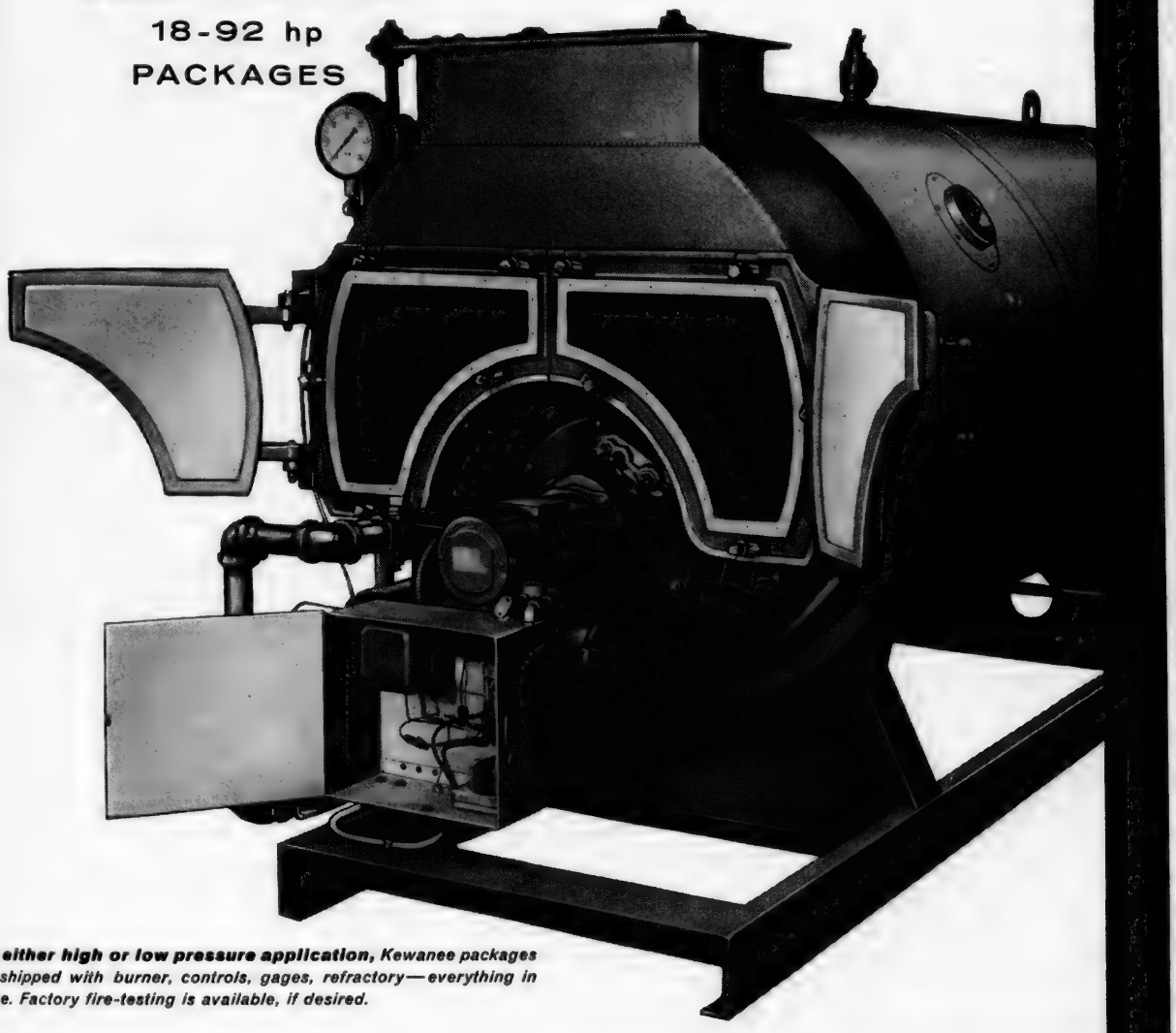
City	May			Season to May 31, incl., from Sept. 1		
	1958	1957	Normal	1957-58	1956-57	Normal
Lincoln, Nebraska (C)	66	162	172	5807	5502	5826
Little Rock, Arkansas (A)	26	22	18	3227	2729	2982
Los Angeles, California (C)	13	44	68	891	963	1432
Louisville, Kentucky (A)	59	86	94	4727	4070	4434
Lynchburg, Virginia (A)	100	69	82	4664	3808	4148
Macon, Georgia (A)	15	15	0	2607	1686	2049
Madison, Wisconsin (A)	221	302	266	7177	6947	7181
Marquette, Michigan (C)	507	462	477	7819	8094	8184
Memphis, Tennessee (A)	36	25	24	3618	2788	3137
Meridian, Mississippi (A)	11	21	9	2810	1892	2333
Milwaukee, Wisconsin (A)	291	381	351	7150	7019	7044
Minneapolis, Minnesota (A)	169	263	259	7223	7472	7748
Moline, Illinois (A)	125	191	199	6514	6090	6311
Montgomery, Alabama (A)	17	11	0	2615	1686	2137
Nashville, Tennessee (A)	56	45	43	4151	3108	3513
New Haven, Connecticut (A)	342	228	261	5682	5699	5956
New Orleans, Louisiana (C)	0	2	0	1555	765	1175
New York, New York (C)	205	133	153	4909	4694	5032
Newark, New Jersey	188	132	148	4990	4832	5241
Norfolk, Virginia (A)	44	59	59	3699	2984	3454
North Platte, Nebraska (A)	137	290	243	6719	6610	6470
Oak Ridge, Tennessee (C)	48	38	58	4065	2877	4028
Oakland, California (A)	101	130	212	2395	2781	2883
Oklahoma City, Oklahoma (A)	24	72	38	4139	3753	3519
Omaha, Nebraska (A)	63	159	175	6061	5773	6123
Parkersburg, West Virginia (C)	113	102	119	5178	4386	4737
Peoria, Illinois (A)	114	159	192	6052	5661	6035
Philadelphia, Pennsylvania (C)	120	113	93	4588	4223	4523
Phoenix, Arizona (A)	0	0	0	1437	1229	1492
Pittsburgh, Pennsylvania (C)	138	118	137	5297	4636	5035
Pittsfield, Massachusetts (A)	413	329	336	7177	7189	7501
Pocatello, Idaho (A)	155	324	317	6552	7060	6840
Portland, Maine (A)	430	331	394	6774	7334	7493
Portland, Oregon (C)	98	143	199	3510	4280	4046
Providence, Rhode Island (A)	309	222	258	5669	5761	6041
Pueblo, Colorado (A)	78	230	203	5276	5361	5682
Raleigh, North Carolina (A)	41	59	29	3937	3067	3075
Rapid City, South Dakota (A)	129	336	357	6565	7259	7331
Reading, Pennsylvania (C)	149	133	123	5061	4789	5044
Red Bluff, California (A)	24	74	51	2799	2599	2546
Reno, Nevada (A)	176	348	318	5660	6095	5783
Richmond, Virginia (A)	70	63	66	4314	3559	3955
Rochester, New York (A)	337	311	289	6652	6451	6766
Roswell, New Mexico (A)	16	33	28	3637	3184	3424
Sacramento, California (C)	27	73	85	2492	2492	2595
St. Joseph, Missouri (A)	69	106	101	5654	5198	4692
St. Louis, Missouri (C)	59	70	94	4795	4270	4462
Salt Lake City, Utah (A)	106	238	233	5512	5731	5785
San Antonio, Texas (A)	0	7	0	1816	1210	1579
San Diego, California (A)	11	53	97	849	1009	1513
Sandusky, Ohio (C)	202	220	217	5962	5606	5818
San Francisco, California (C)	171	215	248	2169	2367	2523
Sault Ste. Marie, Michigan (A)	595	481	499	8392	8854	9016
Savannah, Georgia (A)	14	20	0	2409	1486	1710
Scranton, Pennsylvania (A)	268	264	196	6408	6192	5994
Seattle, Washington (C)	116	147	246	3524	4371	4237
Sheridan, Wyoming (A)	163	352	387	6793	7454	7674
Shreveport, Louisiana (A)	5	15	0	2472	1912	2117
Sioux City, Iowa (A)	83	209	228	6562	6509	6933
Spokane, Washington (A)	143	186	330	5773	6830	6661
Springfield, Illinois (A)	98	125	127	5672	5219	5211
Springfield, Missouri (A)	68	57	118	4918	4272	4669
Syracuse, New York (A)	330	300	247	6602	6407	6454
Toledo, Ohio (A)	233	236	245	6299	6046	6322
Topeka, Kansas (C)	56	110	112	5101	4797	4906
Trenton, New Jersey (C)	161	133	133	4973	4764	5057
Tulsa, Oklahoma (A)	23	36	44	3877	3485	3584
Utica, New York (O)	343	308	253	6957	7431	6796
Valentine, Nebraska (A)	148	320	288	6925	7216	6971
Walla Walla, Washington (C)	71	109	171	4212	5235	4810
Washington, D. C. (C)	67	68	80	4474	3881	4258
Wichita, Kansas (A)	44	103	101	4984	4581	4564
Williston, North Dakota (C)	189	262	360	7849	8608	8859
Winnemucca, Nevada (A)	206	364	299	6127	6571	6241
Yakima, Washington (A)	112	104	205	5255	6223	5785

For footnotes, see page 112.

NEW . . . AND *NEEDED*

KEWANEE®

READY-TO-FIRE
18-92 hp
PACKAGES



For either high or low pressure application, *Kewanee packages are shipped with burner, controls, gages, refractory—everything in place. Factory fire-testing is available, if desired.*

Put Kewanee quality and the package principle together on your next "under 100 hp" project. If it's a high pressure job, choose from 8 packages ranging from 18 to 92 hp. For low pressure applications, Kewanee packages start at 606,000 Btuh and end, eight sizes later, at 3,091,000 Btuh.

These are famous Kewanee Scottie Jr. Boilers factory-teamed with Kewanee Burners for oil, gas or combination oil-gas firing. They arrive on the job ready to fire as soon as they are connected to fuel, water, steam, power and vent. Fuel changeover, in combination firing, is fast and can even be handled by automatic controls. Forced-draft firing eliminates a stack. No unit is higher than an 8-foot standard ceiling.

New literature has recently come off the press on these new Kewanee packages. If you haven't seen it, send the coupon at right to: AMERICAN-STANDARD, KEWANEE BOILER DIVISION, 117 Franklin Street, Kewanee, Illinois.

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Kewanee Boiler Division
117 Franklin Street • Kewanee, Illinois

KEWANEE 1858 1958 90th year

Please supply literature on the following Kewanee Boilers:

☐ high pressure . . 18 to 92 hp, 125-150 lb wp

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NEWS OF THE MONTH

MILLER AWARD

presented to high scorer in activity points among ASHAE student members at Purdue University.

Jay Dee Faris, of Vincennes, Ind., senior in the School of Mechanical Engineering at Purdue University was the recipient of the 1958 W. T. Miller award, presented in Indianapolis. The award, named in honor of Prof. W. T. Miller, was established by the Indiana chapter of the American Society of Heating and Air Conditioning Engineers to strengthen the Purdue students branch, and to create a greater interest among students in the fields of heating and air conditioning.

The award consists of a permanent plaque, hung in the Mechanical Engineering building, with the recipient's name to be added to the plaque each year. Mr. Faris, at left in photo, also received a collection of the best books in the field of air conditioning, a library of fifteen volumes valued at approximately one hundred dollars.

Honorable mention was given to C. Dale Robinson of Bedford, Ind., at right in photo, and Robert J. Ladner (center) of Chicago, both seniors. Each of these students received several books valued at approximately eighty dollars.

The recipient of the Miller award is selected by a committee of the Indiana chapter, and is based on the activity participation of the student branch members. The committee interviews the three students with the highest number of activity points, and selects the recipient of the award. Activity points are accumulated during the year by registering in one or more air conditioning courses, on being an officer or participating in committee work, by attending student branch meetings or joint meetings with the Indiana chapter, by participating in field inspection trips, and by signing new members.

Prof. F. B. Morse, faculty advisor of the Purdue students branch, reports considerable interest in the award by Mechanical Engineering students.

COMMERCIAL LESSEES

top landlords as owners of air conditioning machines, Du Pont survey discloses, contrary to popular belief.

The fact that a merchant in the retail or commercial field rents, rather than owns, his business quarters is no barrier to his purchase of air-conditioning equipment, according to a Du Pont Company survey.

Dispelling a popular belief in the cooling industry that best prospects are found among building owners, the company's recently completed survey of the commercial-industrial air conditioning field discloses that about a half million, or 64%, of current air conditioning installations in retail shops are owned by lessees. The same relationship exists in other commercial business establishments where 420,000, or 63%, of all installations are the property of the lessee.

Only in the industrial field do building owners top lessees in ownership of the mechanical climate control equipment. Of 79,000 air-conditioned industrial establishments in the nation, the Du Pont survey shows 45,000, or 57%, of the installations are the property of the building owner himself.

The Du Pont market study, third major research project of its type to be conducted by the company's Freon Products Division for the air-conditioning industry, also disclosed a sizable number of sales prospects in the commercial-industrial area. Of an estimated 5 million commercial and industrial establishments in the nation, only 22% are wholly air conditioned and 9% are partially air conditioned. The remaining 3.5 million establishments represent the core of the future market for manufacturers of mechanical climate control.

CAL POLY, MANUFACTURER

to design and build a home for maximum human comfort and the lowest possible initial and operating cost.

A residence designed especially for air conditioning will be built in the Los Angeles area as a joint study project by California State Polytechnic College, San Luis Obispo, and Utility Appliance Corp., Los Angeles, manufacturer of Gaffers & Sattler home comfort appliances. The college is said to be the only school in the United States which awards degrees in air conditioning.

Harold P. Hayes, dean of engineering, announced that design of the home for maximum human comfort and lowest possible initial and operating cost was assigned to students of three different disciplines as a practical problem in design education. Coordination is by George Hasslein, head of the Department of Architectural Engineering, with Air Conditioning and Ornamental Horticulture Departments cooperating.

(News of the Month continued on page 118)

"The new PPG Glasfloss Safety-Grille filters definitely improved the service of our air filtering system," states Mr. Arthur C. Kercher. "Their one-piece chipboard construction has eliminated blow-outs and cut replacement time by 40%."

"New PPG Glasfloss® Safety-Grille* filters eliminated blow-outs, reduced replacement time by 40%"

*TRADE-MARK

reports Mr. Arthur C. Kercher, Air Conditioning Engineer, Joseph Horne Co., Pittsburgh, Penna.

"The new PPG Glasfloss Safety-Grille filters greatly improved our air filtering operations at Joseph Horne Co.," states Mr. Kercher.

NO BLOW-OUTS

"With the older type metal grille filters previously used, we experienced frequent blow-outs. Air is drawn through the filter bank at a high velocity; but since switching to Glasfloss Safety-Grille filters, the blow-out problem has been eliminated.

SAFER, FASTER INSTALLATION

"The new chipboard grille of the Safety-Grille filters is superior to the metal grille filters we previously used. Workmen now install the filters 40% faster than before, because there is now no danger of being cut by sharp metal edges."

LONGER SERVICE, COST SAVINGS

"The sturdy one-piece construction of the frame and grille means that we cut costs through their long usage (12 to 16 weeks) and their ease of handling."

DO YOUR AIR FILTERS GIVE YOU THIS GOOD SERVICE?

The new Glasfloss Safety-Grille filters will improve your air filtering system. They are available in a complete range of sizes. Call your local Glasfloss Distributor or PPG Warehouse for top service.

A PRODUCT OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, Minneapolis, New York, Philadelphia, Pittsburgh and St. Louis.

75th ANNIVERSARY 1883–1958

SYMBOL OF SERVICE FOR SEVENTY-FIVE YEARS

PITTSBURGH PLATE GLASS COMPANY

Utility underwrote design costs and will finance construction in San Fernando Valley. Leo Hungerford, national director of sales engineering for the company, and past president of the ASHAE Southern California chapter, is acting as technical advisor to the students.

• **INDOOR CLIMATE CONCEPT**—Thirty-two competitive designs for the house have been created by senior students. Of these, five are being selected by the school faculty with the winning plan to be chosen by a jury of prominent Los Angeles area architects and builders. Construction is scheduled to begin after Jan. 1, 1959, with completion set for the following summer. The study home will be placed on public exhibition.

"Designing the indoor climate is bringing into being a new and total concept approach to home design in which the architect, engineer, and builder will play increasingly important design roles," said Dean Hayes. Coordination of all available thermal knowledge for such total design was recommended by leaders of U. S. industry and education at a UCLA conference in Los Angeles last Fall.

• **SPECIFICATIONS**—Twelve architectural limitations and general specifications imposed on the student engineers as part of the problem were:

(1) Maximum living area using minimum size heating and air conditioning equipment possible.
(2) Outside design temperature, 100 db, 72 wb.
(3) Inside design temperature of 80 db, 50% relative humidity.
(4) Suggested square foot area between 1500 and 1800.
(5) Three or four bedrooms, living room, family room, dining area, kitchen, two baths.
(6) House must sell from $19,500 to $21,500 if built in tract quantities; or on a custom basis, from $22,500 to $23,500, including land costs.
(7) House shall be designed for 60 x 125 ft lot.
(8) Suggested full advantage of roof overhangs to shade exterior walls and glass.
(9) Adequate roof insulation for maximum air conditioning efficiency.
(10) Study of various materials in the construction and use of those materials to help reduce heat gain.
(11) Full advantage of landscaping and its effect in reducing heat gain.
(12) House must be saleable consistent with modern trends of architecture.

BELOW FREEZING AIR

to heat laboratory, the northernmost building with heat pump without supplementary heating.

The Amherst Engineering Laboratory, Buffalo, N. Y., will be heated and cooled by a compound compression air source heat pump developed by York Corp., York, Pa. The first installation of its kind in New York, the laboratory will be the most northerly building to be heated by an air source heat pump requiring no supplementary heating system of any kind. Heating system for the laboratory, built for Sylvania Electric Products Company, will consume only electricity.

Heat pumps, located in a specially designed engine room adjacent to the building, will have a capacity of 250 tons of cooling for summer, 2.4 million Btu per hr for winter heating. Two identical systems, each made up of one 125-hp high stage compressor and one 75-hp low stage compressor, two air cooler-condensers, and one water-cooler-heater, will supply hot or chilled water circulated by a 20-hp pump.

There are 96 fan coil air conditioning units around the perimeter, and the interior areas are air conditioned by a zoned low pressure air system through various types of ceiling diffusers.

WARMING WELL WATER

necessitates switch to refrigerated cooling in Dayton office building. Water rises six degrees in ten years.

Because 60-deg F well water was found to be too warm to do a fully acceptable cooling job by the washed air method, the Hulman Building, tallest commercial structure in Dayton, Ohio, has had to convert to refrigerated cooling. It is now equipped with a 250-hp centrifugal water chiller, manufactured by Airtemp Div., Chrysler Corp., Dayton.

When constructed in 1931-1932, the Hulman became the first building of its size in the country to be completely air conditioned. Each year the equipment has been operated from the first week of May until the beginning of October. Air, tempered by well water, was circulated through the building by air handling units. Water required for the cooling has been pumped from a 125-ft well at a rate of approximately 700 gpm.

• **USED WATER RETURNED TO GROUND**—Over approximately the past ten years, the temperature of the water pumped from the well has risen from 54 to 60 deg F. Geologists attribute the rise to several contributing factors—one being the fact that water is being extracted from the ground faster and in greater volume. Another factor is the re-introduction of the used water at higher temperature into the underground source through disposal wells. These wells are mandatory in most municipalities because the dumping of the increased well water into sewage systems imposes impossible loads on these systems.

The warming of the underground water, a situation prevalent also in other major urban areas of the nation, has progressively lowered the efficiency of the washed air cooling method.

The building's original system cooled the air by forcing it through banks of water sprays located on the first, third and eighth floors. Cooling coils, air handling units, and other components of the original system have been retained and will continue to be used.

Consulting engineer was James A. Ahart; plumbing contractor, C. E. Schulz & Son.

(News of the Month continued on page 120)

How a wise plant modernization program produced more effective ventilation:

Hartzell Panel Fans Replace Monitor Windows

Hartzell square steel panel mountings mean real savings on installation costs for many applications. Any standard or Lo-Noise Hartzell propeller in 24", 28", 32", 36", 44" or 48" diameters is available in this type of construction.

When the monitor windows in this large eastern metalworking plant required repairs, they were removed and replaced with Corrulux translucent panels. Twenty-nine Hartzell 44" direct-drive duct fans were installed to give positive, effective ventilation in place of the uncertain, erratic ventilation achieved by natural draft through the old tilting windows. Improved ventilation throughout the building was an immediate result. The fans were installed with motors on the outside so that all maintenance can be handled from the roof.

This installation suggests one of many ways in which Hartzell fans can be used to improve general plant ventilation. If it is adaptable to your plant, you'll find it a highly economical solution. But no matter what your plant ventilation problem, Hartzell has the fan or ventilator to help you solve it . . . and your nearby Hartzell field engineer has the ventilating "know-how" to help you plan the best installation at the lowest possible cost. If you don't know him, drop us a line for his name and address.

This installation was handled by the Hartzell field office at 333 Arch Street, Camden, New Jersey; phone WOodlawn 4-5256.

Why You Can Count on Hartzell Air-Moving Equipment for Long Life Rugged Reliability and Minimum Maintenance

Hartzell fans and blowers are engineered and built for the exacting requirements of tough industrial service. There's no compromise with quality for the sake of shaving a few dollars on price. Hartzell fans are designed for the industrial buyer who is willing to pay for long life, dependable service and low maintenance.

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ENGINEERING OFFICES IN PRINCIPAL CITIES

NEW RESEARCH CENTER

and administration offices serve various divisions of Carrier Corporation. Unusual acoustics in auditorium.

A new Administration and Research Center, consisting of an administration building, a research center and a service area, are serving Carrier Corp, Syracuse, N. Y.

Entryway to new Carrier administration and research center. Auditorium, with its curved wall is at left; exhibit hall, center; entrance to lobby, right.

The two-story reinforced concrete building provides offices for general management, Financial Division, Carrier International Division, advertising and sales promotion, central production staff, public relations, legal and market research departments. It includes 64,000 sq ft of space. Future expansion is possible by the addition of wings to the south.

• **SPECIAL AREAS**—The Research and Development Division occupies a one-story steel frame building connected by three passageways to a laboratory structure also of steel frame construction. High ceilings in laboratory areas permit cranes, balconies and overhead services. The laboratory area of 38,000 sq ft is divided into individual research centers for studies in special fields. Two large sound rooms with special instruments permit basic studies in the characteristics of noise.

The service area occupies the central position between the administration building and the research center. Its total area of 50,000 sq ft includes a reception center and facilities, an exhibit hall, the J. I. Lyle Memorial Auditorium, a cafeteria and general offices. The auditorium can seat 550 people, and the unusual acoustical treatment permits a person speaking in the audience to be clearly heard without the aid of an amplifying system.

Office building of 29,000 sq ft also contains the Logan Lewis Library.

OIL AND GAS

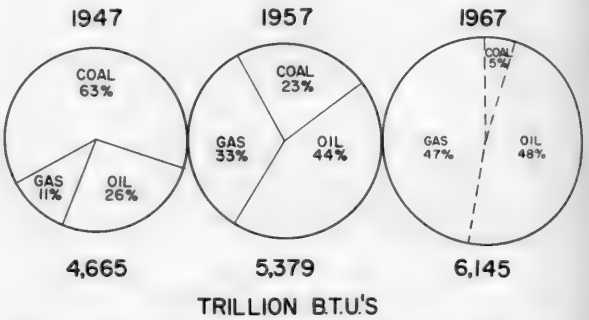
will share about equally ninety-five percent of the nation's fuel-for-heating market by 1967, oilman says.

Barring war, major national catastrophies, a significant change in the world political balance of power, a major depression, or significant change in the weather pattern for the United States, some fairly reliable predictions on fuel consumption in the next ten years can be made. Speaking before the Fuel Oil Committee of the American Petroleum Institute at Point Clear, Alabama, oilman L. S. Marshman took a hard look at the future in a frank talk on the outlook for oil heating.

The prognosis of Mr. Marshman, who is manager of the Fuel Oil Div., Socony Mobil Oil Co., Inc., is seen in the accompanying chart. Pre-war consumption of fuel in the United States for heating homes and commercial establishments is shown in the left circle. The area of the circle in the center is 15% larger, reflecting the increased consumption of fuel for heating in the intervening ten years. The reason for this increase, Mr. Marshman says, is not only the growth of population, but also the unprecedented growth in the number of family units, or dwelling units. While population grew 18%, the number of dwelling units grew by 33%. During this period, oil increased its sales from 580,000 to 1,070,000 barrels per day and its share of the market rose from 26% to 44% of the market. In the same period, however, the percentage of the market that went to gas rose from 11 to 33, an increase from 4.9 to 16.9 billion therms. (One therm equals 100,000 Btu.) Thus, while oil consumption nearly doubled, gas consumption more than tripled.

An increase of 14% in the total amount of energy needed to heat the United States, from 5,379 in 1957 to 6,145 trillion Btu in 1967 will take place, Mr. Marshman predicted, compared to a 15% increase for the previous decade. A change in the national population pattern is

USE OF ENERGY FOR HEAT — U.S.A.



seen as the reason for this slight decline in the rate of increase. For the next five years those persons that reach adulthood, marry, and establish new dwelling units will be, primarily, those who were born during the depression in the thirties, when the birth rate was low. In about the year 1963, however, the curve will rise, reflecting the increase in the birth rate after 1940.

• **ELECTRICAL HEATING GROWS**—As to electricity, heat pumps, atomic heating, and solar energy, Mr. Marshman does not think any of them shows promise of being a serious competitor in the next ten years. Electricity, he admits, is already something of a competitor. During the last year, 300,000, or one percent of all dwelling units, were so heated, but they are concentrated in Tennessee and the Pacific Northwest, where power cost

(News of the Month continued on page 122)

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Each OTM product is guaranteed to be free from manufacturing defects. If failure occurs within one year after shipment, any OTM product will be replaced without charge when the following conditions have been met:

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When the product is to be welded, provided it has been welded in accordance with recognized practices and within such Standards as A.S.M.E. and A.W.S. Codes.

Provided it has not been worn out due to severe operating service, such as is encountered under extremely corrosive, abrasive or acid conditions which the steel was not made to withstand.

OTM Corporation will pay all transportation charges and any necessary expense incurred to remove and replace any OTM product proved to be defective.

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is very low. From 40,000 to 45,000 new electric heating installations are expected in the next decade, and by 1967, it is expected that 700,000 to 750,000 homes will be centrally heated with electricity. Mr. Marshman warns the industry not to ignore this competitor because many people will be attracted to the cleanliness, convenience, and safety factors of electric heat, especially in those areas of the country where winters are mild. In addition, many utilities are experiencing a summer peak load due to air conditioning, and are offering attractive winter rates to balance that load.

Application of the heat pump, Mr. Marshman says, depends on the cost of electricity, climatic conditions, and upon developments in technology that make it applicable in more northerly areas. He cites York Div., Borg-Warner Corp., General Electric, Westinghouse Electric, Carrier Corp., and Fedders-Quigan Corp., as among those companies who are working on improvement of the heat pump.

• **ATOMIC HEATING FAR OFF**—Atomic heating will not become economically feasible for home heating in the foreseeable future, the speaker said, but cited important research toward its development for use for heating in the pulp and paper industries, and for other industrial use, by Lockheed Aircraft and Republic Steel. Solar heating is likewise dismissed as a serious competitor in the near future, except, perhaps, in areas like Arizona, which builds up very few Degree Days in the course of the winter.

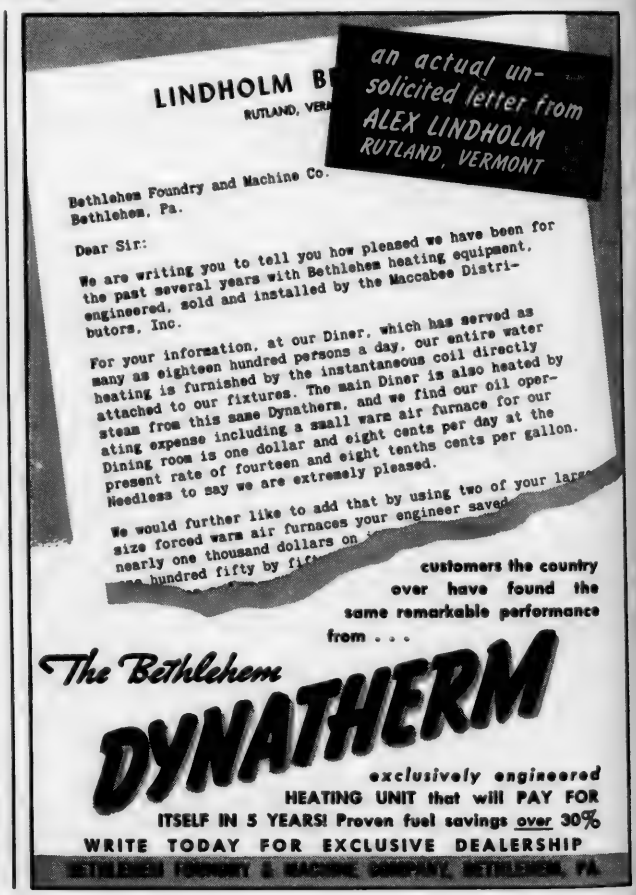
Gas heating will make its biggest percentage increases in the next five years in New England, Mr. Marshman said, and lesser increases in the Middle Atlantic and Eastern North Central states. The gas utilities leave "few unturned stones", he said, citing Providence, R.I., where the utility has out on rental nearly 1,100 gas central heaters and 3,500 gas water heaters.

• **GAS-OIL COMPETITION**—Gas now enjoys advantages both in burner installation cost and in fuel price in some parts of the country, he continued. The announced expansion plans of the gas utilities indicate that they plan to make use of each advantage as fast as supplies and distribution facilities permit. It appears, then, that future expansion in heating oil installations will be chiefly in areas beyond the reach of the gas mains, and in other areas where the demand for fuel is in excess of available gas supplies. A factor that may negate some of the competitive advantages of gas is a probable increase in the price of gas at a faster rate than the increase in the price of oil, Mr. Marshman said.

For the past half century there has been a warming trend on the North American continent, and this has affected the oil heating suppliers particularly because they have had to maintain reserves against the possibility of severe winters that often did not materialize. A lot depends, for the future of the industry, on what the climate will be in the next ten years.

(News of the Month concluded on page 124)

Another
CAINS
COIL OF PROFIT
SCOOP-RAIL
ELIMINATES
• Radius ell, transition, and splitter damper at branch duct take-offs.
• Volume damper on grille.
• Special keys, wrenches, etc., for volume adjustment.
• Job delay in ordering.
SCOOP RAIL, most economical method devised for fabricating precision, adjustable air scoops for branch ducts and grille collars insuring uniform air distribution across branch duct or over entire face of grille. 50 speed nut tabs for ⅜" square rod in each carton.
Union Made
SOLD ONLY THROUGH JOBBERS AND DISTRIBUTORS
Some Territories Open for Manufacturers Agents Calling on Jobbers and Distributors
CAIN MANUFACTURING CO.
Birmingham Alabama


an actual unsolicited letter from ALEX LINDHOLM RUTLAND, VERMONT
LINDHOLM B
RUTLAND, VER
Bethlehem Foundry and Machine Co.
Bethlehem, Pa.
Dear Sir:
We are writing you to tell you how pleased we have been for the past several years with Bethlehem heating equipment, engineered, sold and installed by the Maccabee Distributors, Inc.
For your information, at our Diner, which has served as many as eighteen hundred persons a day, our entire water heating is furnished by the instantaneous coil directly attached to our fixtures. The main Diner is also heated by steam from this same Dynatherm, and we find our oil operating expense including a small warm air furnace for our Dining room is one dollar and eight cents per day at the present rate of fourteen and eight tenths cents per gallon.
Needless to say we are extremely pleased.
We would further like to add that by using two of your large size forced warm air furnaces your engineer saved
nearly one thousand dollars on
customers the country over have found the same remarkable performance from . . .
The Bethlehem
DYNATHERM
exclusively engineered
HEATING UNIT that will PAY FOR ITSELF IN 5 YEARS! Proven fuel savings over 30%
WRITE TODAY FOR EXCLUSIVE DEALERSHIP

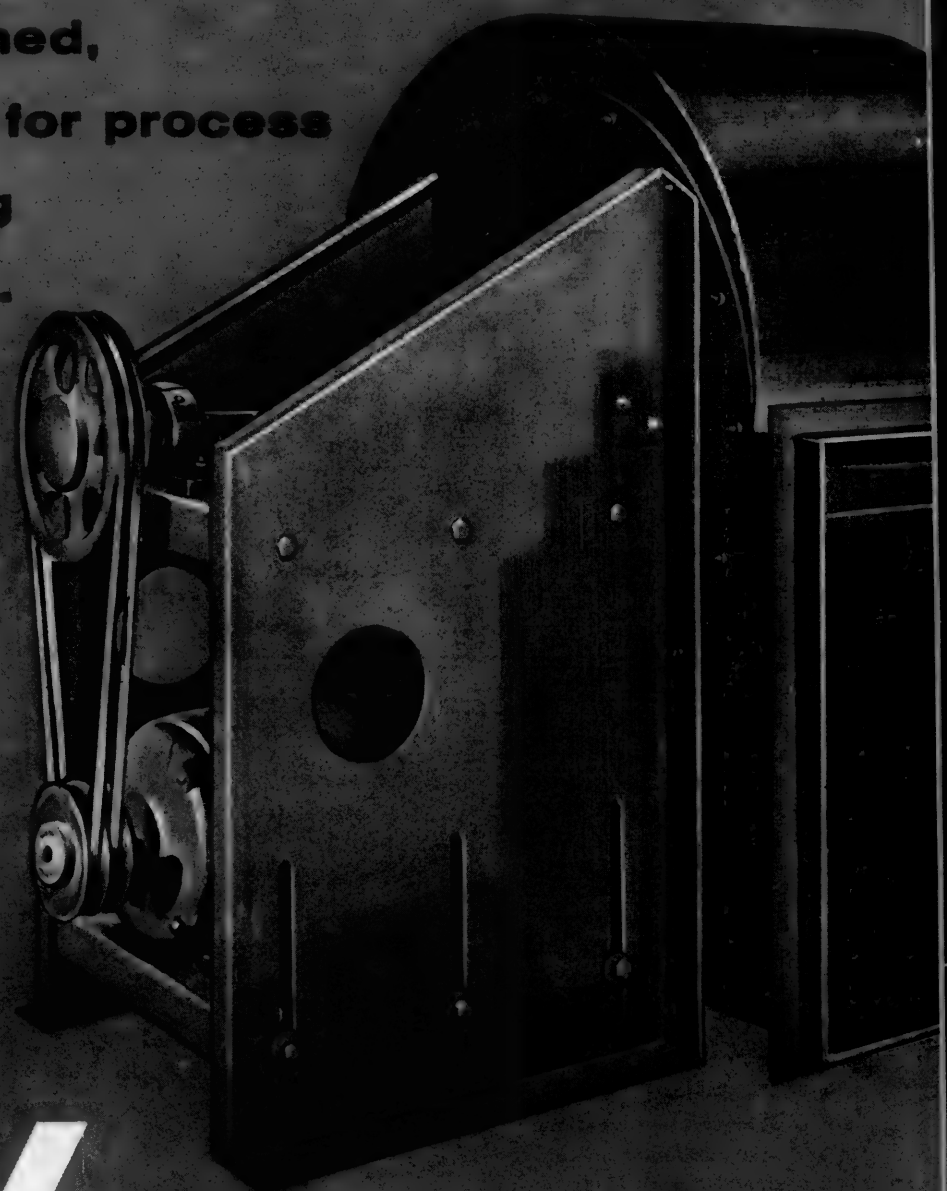
BIG

The BIG year for BIG performance

GENERAL PURPOSE FANS

. . . self-contained, portable units for process and ventilating applications . . .

From design through maintenance, present day air handling problems demand BIG performance from fans. And General Purpose Fans do the job, give you that BIG performance. They're made in four types, 12 basic sizes, with capacities from 180 to 19,070 Cfm; in both constant speed units with direct connected motors and adjustable speed units with V-belt drives and integral resilient motors; particularly for use with duct systems. Send for Bulletin 563.



nyb

THE NEW YORK BLOWER COMPANY

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UN-ASSEMBLED PACKAGE BOILER

shipped to apartment store remodeling site because boiler room door is too small to accommodate unit.

"Package" and "factory-assembled" are usually synonymous terms at Babcock & Wilcox, but the New York boiler manufacturer announced the field erection of one of its package boilers and related steam-generating equipment as the initial phase of a power plant modernization program at the Abraham & Straus department store in Brooklyn, N. Y.

Because of the limited size of the entrance to the building's boiler room, the unit was shipped to the store in sections. Designed for a pressure of 250 psi, the unit's maximum steam output is 32,500 lb per hr at 125 psi. Oil will be burned initially, but natural gas firing is provided also. Meyer, Strong & Jones, New York City, is the consulting engineer.

WHAT READERS SAY

Heating Design for Hospitals

EDITOR, AIR CONDITIONING, HEATING AND VENTILATING:

The article, Heating and Ventilating System Design for Hospitals, by Mr. J. E. York in your April and May issues contains information of value to consulting engineers. You are doing a good service to the industry when you obtain and publish such articles. I do have some comments relating to his statements about steam heating systems and vacuum pumps.

He classifies steam systems as (a) continuous pressure with on-off thermostatic control of each heating unit and (b) varying the pressure of the whole system, or by zones, by automatic means with only manual control of the heating units. I want to point out that system (b) is again classified as "orifice" and "sub-atmospheric" systems. He doesn't say how these systems accomplish space temperature control and perhaps because of this he has made a statement which may not be clear to the reader.

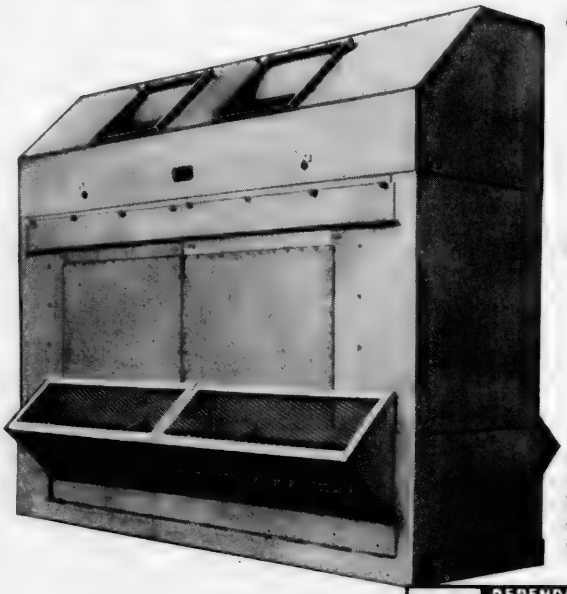
He says that with system (b) the heating units are constantly filled with steam. However, the orifice system depends almost wholly on partial filling of the heating units with steam in order to obtain temperature control, and if the heating units were constantly filled with steam there would be practically no temperature control and gross overheating would take place most of the time. Sub-atmospheric systems likewise depend on partial filling but to a much lesser extent and in very mild weather only. Both systems require the use of some kind of an orifice plate at the inlet to each heating unit and this point Mr. York does not mention.

He says pipe sizes for system (b) are "generally large" and again that "sub-atmospheric systems require rela-

(Continued on page 126)

SAVE FIVE WAYS WITH FRICK
EVAPORATIVE CONDENSERS

- **WATER** Evaporative condensers take advantage of the heat absorbed in the evaporation of water—saving water and power to pump it.
- **LABOR** Superior design and better materials (galvanized throughout) make Frick condensers more efficient and easier to maintain.
- **TIME** Frick - Mollenberg controls are automatic — save time and keep condenser operating steadily in all kinds of weather.



- **POWER** Ample cooling surfaces and conservative ratings enable Frick condensers to lower the condenser pressure and temperature and save power.
- **MONEY** Reasonably priced and far more durable, they are economical to own and operate. A stock item, they are available for immediate shipment.

Frick Company manufactures a complete line of air conditioning and refrigerating equipment, designed for your individual requirements.

WRITE FOR YOUR FREE COPY OF THE NEW BULLETIN 234 TODAY

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA., U. S. A.

FICTION FACT

FICTION:

Heavy weight is a requirement for heavy duty panel type air filters.

FACT:

R P Aluminum Industrial Air Filters weigh only 4 pounds (20" x 20" x 2") compared to 12 pounds for a steel filter of equivalent size.

RP

Multi-Velocity Industrial AIR FILTERS

Strength and ruggedness, with light weight, is an important advantage of R P Multi-Velocity Industrial Air Filters. Constructed of aluminum, these permanent-type washable filters are safe and easy to handle, during installation... during cleaning; eliminate the necessity for expensive, heavy structural design in filter bank construction; reduce operating costs through longer service life and faster, easier handling; are non-rusting, corrosion-resistant.

Plus—ODOR REMOVAL—automatic, efficient absorption of odors through the use of R P Super Filter-Coat, the odor and dirt removing adhesive. *Write for complete information.*

RP *Products of Research*

RESEARCH PRODUCTS *Corporation*

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ALL STANDARD D-H "PERMA-FAN"

DRAYER

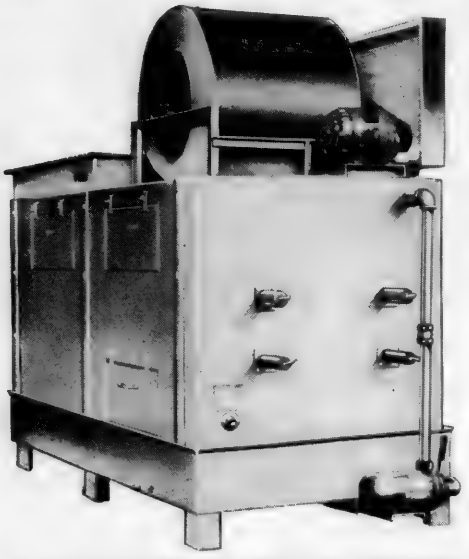
EVAPORATIVE CONDENSERS

HANSON

ARE HOT-DIP GALVANIZED

"PERMA-FAN"

AFTER FABRICATION!



A D-H EXCLUSIVE! FOR FREON 12; FREON 22; AMMONIA. THE D-H PIONEERED BLOW-THRU PRINCIPLE... NOT DRAW-THRU! PRIMARY COIL SURFACE COPPER TUBING. VOLUME DAMPER ADJUSTMENTS. PRICE? WAY DOWN, ON BEDROCK! 12 MORE FEATURES SHOWN IN OUR "PERMA-FAN" BULLETIN. MAY WE SEND YOU A COPY? WRITE:

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drayer-hanson

DIVISION OF NATIONAL-U S RADIATOR CORP

3301 MEDFORD STREET

LOS ANGELES 63, CALIFORNIA

CABLE: CLINCONI LOS ANGELES

(Continued from page 124)

tively large piping." I assume he is making the comparison with systems (a), not with hot water systems. If I am correct, I want to point out that piping for both (b) systems is sized in the usual manner with no increase because these types of control are used. In fact, the piping for sub-atmospheric systems can be sized on a slightly higher pressure drop than usual, which might result in a reduction of a few pipe sizes, because as the vacuum increases, the required steam flow decreases and the pressure drop goes down.

The basis for sizing vacuum pumps for air capacity as suggested by Mr. York is quite contrary to our experience and to the prevailing practice.

It has been standard practice for many years to size vacuum pumps on the basis of from 0.5 cfm per 1000 sq ft EDR in the small sizes down to 0.3 cfm in the large sizes, at 5½-inch vacuum Hg. It has been found that with this capacity, the pumps will satisfactorily maintain a vacuum averaging 5½-inch in the return mains provided the piping has been tested for leaks, as all piping should be. We have found from wide and long experience that our pumps, so rated and tested, will operate properly at up to 25-inch vacuum although some other types will not function as they should at a vacuum in the range of 15 to 20-inch regardless of the basis used for rating or testing. Thus it is more the design and construction rather than any test which is the criterion.

Mr. York suggests an air capacity of from 0.75 to 1.5 cfm per 1000 sq ft EDR for duplex pumps according to the vacuum used. This is from 2½ to 5 times the capacity which experience teaches us is necessary. This excess capacity makes it possible for the installing contractor to demonstrate that the piping is apparently tight by showing a good vacuum with the pump running whereas there may actually be abnormal leakage which would show up immediately if the pump is stopped and the gage watched to see how quickly the vacuum vanishes. If the piping is tested with water or air before acceptance, there will be no need for the high air capacities as suggested by Mr. York.

Air leaking into the return lines is a primary cause of pipe corrosion. Obviously every effort should be made to eliminate this leakage. If this were not done, then to use a vacuum pump which has a capacity sufficient to handle more than the minimum air requirement only means that the owner will eventually pay the bill for replacing corroded piping.

Finally, high air capacity may mean larger motors. In any event if the piping is not tight excessive hours of operation will cause a substantial increase in the owner's electric power bill. The pumps may be able to pull a good vacuum but at high cost.

The sole advantage of air capacity in excess of the industry code requirement is that in a large spread out job, where the mains are abnormally long in comparison with the risers, the time required to achieve uniform and complete circulation when starting up is reduced.

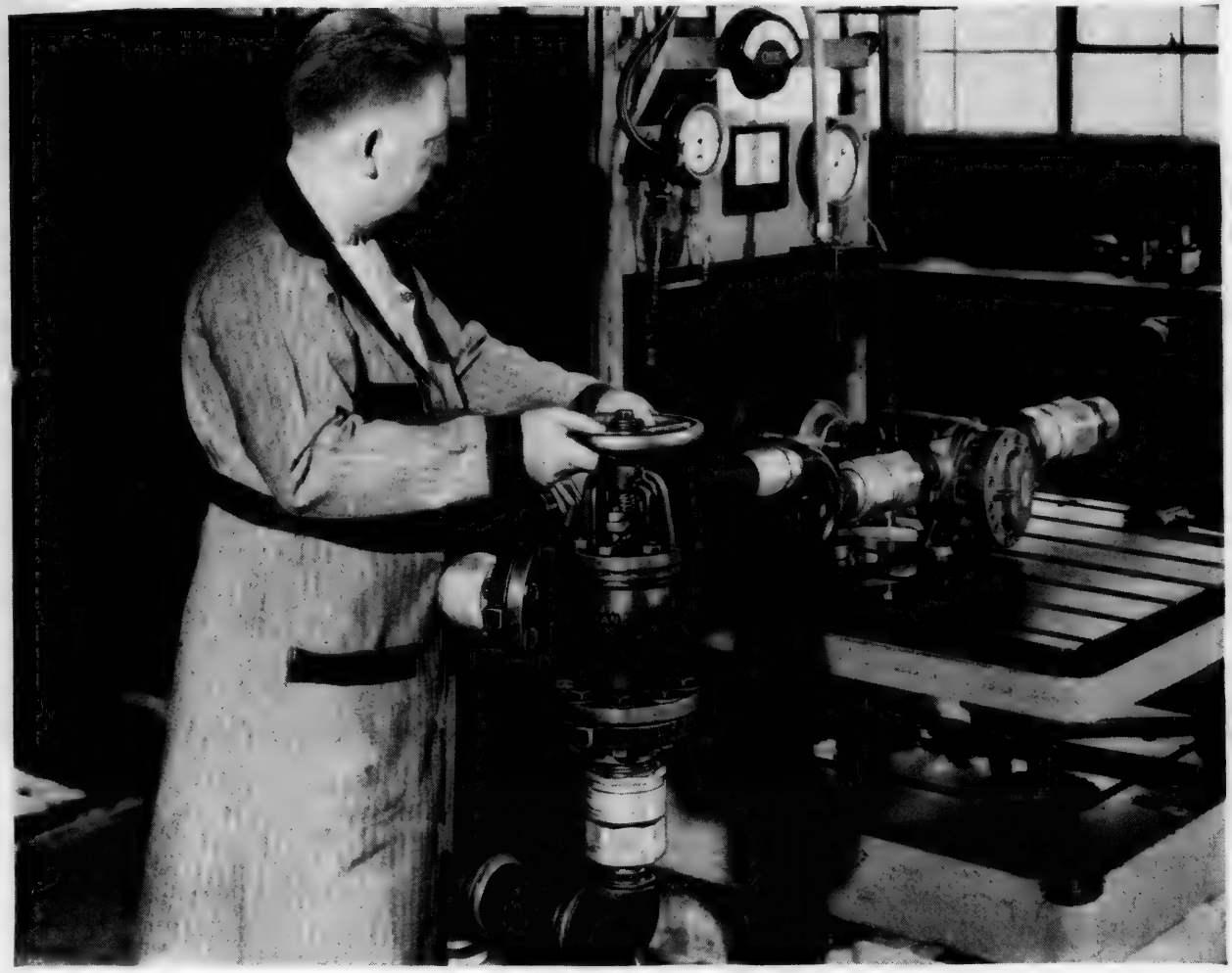
Lewis Smith

Pelham, N. Y.

The letter from Mr. Smith was sent to the author for his comments. Mr. York's reply follows:

(Continued on page 128)

Roper Hydraulics, Inc. Experiences CRANE Quality



Uses CRANE valve on severe throttling for 23 years—without repairs

Twenty-three years ago, Roper Hydraulics, Inc., Rockford, Ill., installed this Crane 2½-inch, 300-pound bronze plug disc angle valve for throttling service on a 300- to 400-pound pump test line. Since then, testing has been done at pressures up to 1000 pounds without valve failure.

Altogether, this Crane valve has been operated intermittently on an average of 30 hours weekly for 23 years! Only recently was it necessary to replace some of its working parts. Here is demonstrated proof that Crane quality is really the durable kind purchasing agents seek . . . the dependable kind that engineers and plant operating people want.

In valves and fittings for every service, Crane quality gives greater assurance of value—it's today's most reliable price tag. And on all your piping equipment needs, you can get prompt delivery through your local Crane branch or wholesaler.

IDEAS FOR YOU in the 36-page booklet "Valve Performance Facts." Ask your Crane Man for a copy, or write to the address below.

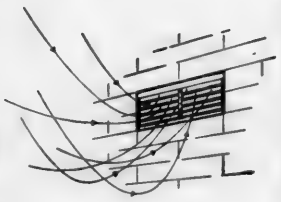
CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

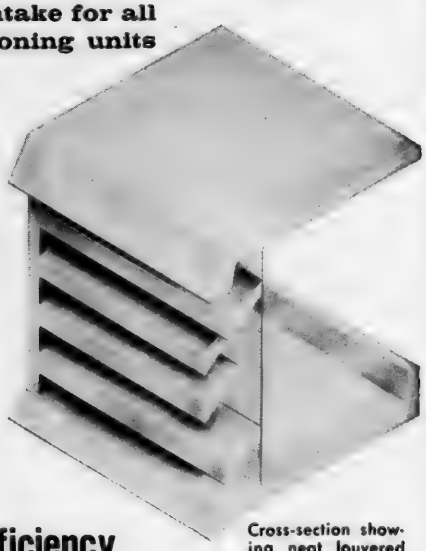
Since 1855—Crane Co., General Offices: Chicago 5, Ill.—Branches and Wholesalers Serving All Areas

C/S

modular brick size vents



ideal air intake for all air conditioning units



Cross-section showing neat louvered face, integral cast waterstop and screening.

for

high air intake efficiency

neat appearance

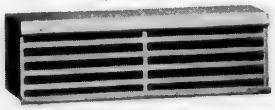
weatherproofness

economy

Specify and buy C-S brick size vents. C-S brick size vents have high free area and low static pressure. Because they are cast aluminum, they are neat, rugged, durable and good looking — they cannot rust, corrode or stain adjacent walls. C-S brick size vents are available in seven modular sizes, five in standard brick — two in jumbo brick for neat, easy installation in either brick or cinder block construction. Five finishes are available including alumiliting or epoxy color coatings.

One of 7 modular sizes —the model 4-B is equal to four standard bricks. Measuring 16½" x 4⅞" x 4" it has a free area of 39 square inches. For other models, dimensions, free areas see our 1958 catalog.

A precision cast aluminum product



model 4-B

Write today for complete specification information, sizes, free areas, finishes, ducts, grilles, registers.

C/S **CONSTRUCTION SPECIALTIES, INC.** **Dept. 50**
55 Winans Avenue **Cranford, New Jersey**

Please send me complete information on

☐ specifications ☐ prices ☐ technical data ☐ finishes ☐ accessories.

Name_____ Position_____

Firm_____ Address_____

(Continued from page 126)

The comments of Mr. Lewis Smith of Dunham-Bush, Inc. on my article, Heating and Ventilating System Design for Hospitals, are appreciated, as constructive criticism is always of value.

In that part of the article which dealt with the building heating, the three following types of systems were considered:

1. Hot water with forced circulation and individual room temperature control.

2. A vacuum system supplied through a pressure reducing valve with steam at about 2 psi and individual room temperature control.

3. A zoned system with each zone supplied through a control valve at varying pressure from slightly above atmosphere to several inches of vacuum. The pressure of the steam supplied to each zone is controlled by a single device responsive to both inside temperature and outside weather conditions. The vacuum pump is automatically controlled to maintain a constant pressure differential between the supply and return side of the system. Radiators should be equipped with hand operated valves to permit shutting off the steam supply to rooms which are not in use. Orifices on the inlet connections are sometimes used to control the steam supply to the radiators in each room.

With system (1) additional control may be provided to regulate the water temperature in accordance with the outside temperature.

With system (2) the pressure of the steam supplied to the system remains constant unless manually adjusted for seasonal variation. The vacuum pump is provided to insure rapid removal of air and condensate from the system and not for the purpose of maintaining a vacuum on the supply side of the system. The room temperature control may be either of the modulating or "off and on" type.

With system (3) the pressure and consequently the temperature, of the steam supplied to each zone changes with changing outside conditions and consequently the rate of heat liberation to the area changes, but there is no individual room control.

Recommended pipe sizes for hot water systems using iron pipe are based on a friction loss of about 240 milinches per foot, and on this basis a one inch pipe would have a capacity of 5.0 gpm which with a 20 deg F temperature drop would deliver $5 \times 8.3 \times 60 \times 20 = 50{,}000$ Btu per hour.

A vacuum heating system with a 2 oz drop per 100 feet of equivalent run would require a 1½-inch pipe to supply the same amount of heat.

While the same tables may be used for sizing the piping for a sub-atmospheric system and a low pressure or vacuum system, these tables provide for a wide choice in the pressure drop through the system. Because of the greatly increased pressure drop required through the system as the density of the steam is decreased, it is suggested that the piping for a sub-atmospheric system be sized more liberally.

The capacity of the vacuum pumps which should be provided is debatable, but in Chapter 20 of the 1958 issue of the Heating, Ventilating, Air Conditioning Guide.

(Concluded on page 130)

Shown above are two Iron Fireman RFA-60 burners and Titusville boilers in operation at the New York Telephone Company, New York, N. Y. Burners are forced draft for firing oil. Mr. Edward L. McHugh, Building Maintenance Supervisor of the New York Telephone Company states, "Dependable, uninterrupted service and minimum maintenance has characterized the operation of these burners." Architect: Vorhees, Walker, Smith and Smith, New York; Consulting Engineer: Syska & Hennessey, New York; Heating Contractor: Jarcho Bros., Long Island, N. Y.

Iron Fireman Boiler-Burner Units Offer You These Advantages

Easy to size and specify. After deciding on the fuel (gas, oil or gas-oil dual fuel) and determining the required load, it is only necessary to refer to a simple chart to find the correct size of boiler-burner unit for your job.

No high stacks — no high ceilings. Forced draft eliminates costly and unsightly stacks. Compact boiler requires little headroom.

Low installation cost. Installation costs are low. No special boiler setting; no intricate wiring (factory wired and tested control panel is part of the unit); no complicated piping; no on-the-job refractory work. Factory engineering throughout assures exceptional fuel economy. Models for any type of high or low pressure gas, or any grade of oil from No. 2 to low cost No. 6.

Separate firing units available for all types of boilers. The Iron Fireman forced draft burner is a complete firing system which requires little, if any, firebox alteration, no pit for underfloor air, no ignition arch. Easily applied to new or existing boiler settings.

Send for catalog with complete specifications

IRON FIREMAN.

AUTOMATIC FIRING EQUIPMENT
FOR OIL, GAS, COAL

IRON FIREMAN MANUFACTURING COMPANY
3071 West 106th Street, Cleveland 11, Ohio.
(In Canada, 80 Ward Street, Toronto, Ontario.)

Please send information on following equipment:

- ☐ Complete boiler-burner units.
- ☐ Forced draft firing units.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

two holes in the sky...

cool water for air conditioning

Two 16' 4-blade "AL-Metal" Propellers, *efficiency-engineered* to this application, keep working temperatures uniform in a large midwestern office building. By the people who designed and developed the famous "Macheta" Airfoil Propeller — acclaimed as *industry's most efficient air-moving surface!*

Photo courtesy Watercooling Equipment Co., St. Louis

Write for free Bulletin 510.

Aerovent

FAN COMPANY, INC.

ASH and BRANDT STS. • PIQUA, OHIO

304 Wright Bldg. • Tulsa 3, Oklahoma

(Concluded from page 128)

the following statements are found under the heading Vacuum Heating Pumps:

"For average design conditions, the theoretical condensing rate of a heating system is approximately 0.5 gpm per 1,000 sq ft equivalent direct radiation (EDR) served. Vacuum pump water delivery rates generally should be the same as for condensation pumps, which range from 2 to 3 times the design condensing rate. This provides sufficient capacity for peak loads and for intermittent automatic operation."

Again:

"For low vacuum systems where the returns are controlled at an average vacuum of 5.5 inches Hg vacuum and the temperature averages 150 deg the various manufacturers of vacuum pumps provide pump capacities from 0.3 to 1.0 cfm of air per 1000 sq ft equivalent direct radiation served. For high vacuum systems, the vacuum pump air capacity requirements are generally greater. A capacity of 2.0 cfm of air at 20-inch Hg vacuum per 1000 sq ft equivalent direct radiation served is a typical capacity furnished on high vacuum systems."

J. E. York

Harwich, Mass.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

HEAT TRANSFER CONFERENCE AND SHOW—Second National Heat Transfer Conference and exhibits, Edgewater Beach Hotel, Chicago, sponsored by American Institute of Chemical Engineers, 25 W. 45th St., New York 36, N. Y., and American Society of Mechanical Engineers, 29 W. 39th St., New York, N. Y. ..... **AUGUST 18-20, 1958.**

INSTRUMENT-AUTOMATION EXHIBIT — Instrument-Automation Conference and Exhibit, of the Instrument Society of America, at Philadelphia Convention Hall, Philadelphia, Pa. Secretary of the Society, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **SEPTEMBER 15-19, 1958.**

ELECTRONICS CONFERENCE—1958 National Electronics Conference, sponsored by the American Institute of Electrical Engineers, Illinois Insitute of Technology, Institute of Radio Engineers, and Northwestern and Illinois Universities, to be held at the Hotel Sherman, Chicago. R. E. Hornacek, Publicity Committee Chairman, Illinois Bell Telephone Co., 208 W. Washington St., Chicago 6, Ill. ..... **OCTOBER 13-15, 1958.**

AGA CONVENTION—Annual convention, American Gas Association, at Convention Hall Auditorium, Atlantic City, N. J. Secretary of the Association, 420 Lexington Ave., New York 17, N. Y. ..... **OCTOBER 13-15, 1958.**

REFRIGERATION WHOLESALERS MEETING—Annual meeting of the Air-Conditioning and Refrigeration Wholesalers, at the Sheraton-Palace Hotel, San Francisco, Calif. Secretary of the Institute, 2607 N. High St., Columbus, Ohio. ..... **OCTOBER 22-24, 1958.**

PLASTICS INDUSTRY EXPOSITION—Eighth national plastics exposition of the Society of the Plastics Industry, Inc., at International Amphitheatre, Chicago, Ill., to be held concurrently with the SPI annual national conference, Morrison Hotel, Chicago. Secretary of the Society, 250 Park Ave., New York 17, N. Y. ..... **NOVEMBER 17-21, 1958.**

POWER SHOW—23rd National Exposition of Power and Mechanical Engineering, under the auspices of The American Society of Mechanical Engineers, in conjunction with the Society's 78th annual meeting, at the Coliseum, New York. E. K. Stevens, president, International Exposition Co., 480 Lexington Ave., New York 17, N. Y. ..... **DECEMBER 1-5, 1958.**

EXPOSITION AND ASHAE CONVENTION—65th annual meeting, American Society of Heating and Air-Conditioning Engineers (Jan. 26-29, 1959) and 14th International Heating and Air Conditioning Exposition, Philadelphia, Pa. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. ... **JANUARY 26-30, 1959.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at the Americana Hotel, Bal Harbour, Fla. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **APRIL 1-3, 1959.**

ASRE CONVENTION—Convention of the American Society of Refrigerating Engineers, at the Hotel Traymore, Atlantic City, N. J. R. C. Cross, secretary of the Society, 234 Fifth Ave., New York 1, N. Y. ..... **OCTOBER 30-NOVEMBER 1, 1959.**

ARI EXPOSITION—11th Exposition of the Air-Conditioning and Refrigeration Industry at Convention Hall, Atlantic City, N. J. Geo. S. Jones, Jr., managing director of Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 2-5, 1959.**

ASHAE MEETING—66th annual meeting of the American Society of Heating and Air-Conditioning Engineers, and the 2nd Southwest Heating and Air-Conditioning Exposition, sponsored by ASHAE, in Dallas, Tex. The meeting will be at the Baker and Adolphus Hotels, and the Exposition in the Memorial Auditorium. Secretary of the Society, 62 Worth St., New York 13, N. Y. . . **FEBRUARY 1-4, 1960.**

Canadian Degree-Days for May, 1958*

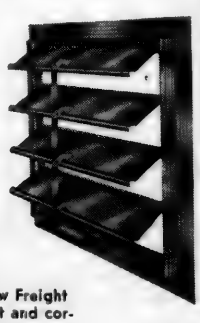
City	May		Cumulative	
	1957	Normal	1957-58	Normal
Calgary, Alta.	273	460	8635	8970
Charlottetown, P. E. I. ...	518	560	7195	8330
Crescent Valley, B. C. ...	207	400	6836	7610
Edmonton, Alta.	256	410	9009	9830
Fort William, Ont.	576	540	9483	10180
Grande Prairie, Alta.	338	460	9976	10390
Halifax, N. S.	487	484	3219	7246
London, Ont.	349	330	7109	7230
Medicine Hat, Alta.	152	320	7913	8450
Moncton, N. B.	481	480	7475	8500
Montreal, P. Q.	395	270	7515	8240
North Bay, Ont.	545	470	8837	9520
Ottawa, Ont.	419	330	7780	8580
Penticton, B. C.	126	260	5518	6270
Prince George, B. C. ...	311	480	8056	8980
Quebec City, P. Q.	474	430	8247	9240
Regina, Sask.	258	420	9423	10400
St. John, N. B.	555	510	6382	8380
Saskatoon, Sask.	296	420	9671	10610
Timmins, Ont.	668	550	10148	11060
Toronto, Ont.	338	316	6470	6898
Vancouver, B. C.	180	320	4537	5230
Victoria, B. C.	280	350	4462	4870
Windsor, Ont.	253	270	6371	6560
Winnipeg, Man.	358	411	9359	10399

*These data are supplied through the courtesy of the Meterological Division Air Service Branch, Department of Transport, Canada.

The Department reports slight revisions in the figures for April as published in last month's issue. Corrected figures are: Edmonton, Alta., 728; Victoria, B. C., 480; Windsor, Ont., 509.

Elgd Ventilating Specialties

NEW! EXTRUDED ALUMINUM SHUTTERS



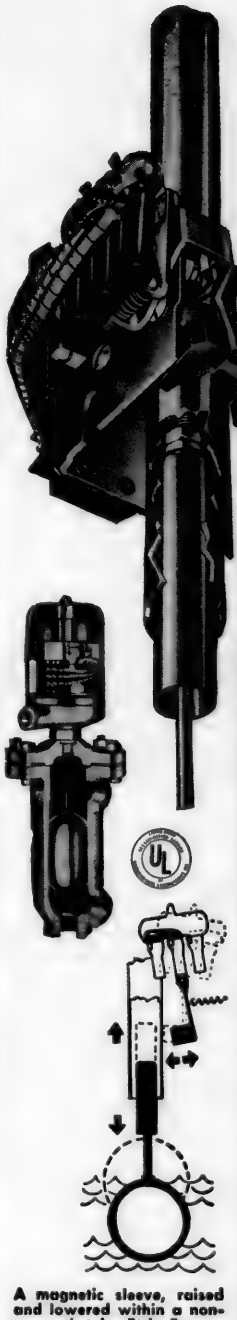
Shutters of modern design which give you ALL of these features: Lightweight, Full Weather Strip, Low Freight Cost, Easier installation, Concealed Pivot Pins, Rust and corrosion Proof and Natural aluminum finish with fluted frames.

Write for complete specifications.

Free Catalog

ELGO SHUTTER & MANUFACTURING CO.
Dept. 1, 2738 W. Warren Detroit 8, Michigan

WHY you are SAFER with MAGNETROL BOILER WATER LEVEL CONTROL



A magnetic sleeve, raised and lowered within a non-magnetic tube, "trips" or releases an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

A Few of MANY Reasons:

• Operating Life Is Practically Unlimited
A PERMANENT Alnico magnet, located *outside* the float chamber, links boiler water level and electrical controls. This simpler magnetic link eliminates mechanical parts subject to wear and fatigue failure. *Pioneered and perfected by Magnetrol.*

• Customized Corrosion Control
Floats can be fabricated from a variety of materials to meet any "special" local corrosion problems. Type 304 stainless steel floats have proven over the years to have the greatest all-around corrosion resistance, and so are furnished as standard.

• "No-Scale" Float Chamber Liner
Exclusive self-cleaning brass liner actually "flexes" off corrosion—prevents scale growth and "sticking" of float.

• Up to Three Switches—an Exclusive Safety Feature
Only MAGNETROL design can provide up to three completely separate switch mechanisims, each operating at its own level, in a STANDARD control. Use extra switch for "stand-by" pump for emergency use; or alarm BEFORE fuel cut-off; or high level alarm; etc.

• Least Maintenance
Once-a-shift blow down and once-a-month visual inspection of switch housing are only regular maintenance. *Built SAFE, Magnetrols stay SAFE.*

We offer STANDARD Magnetrol Boiler Water Level Controls for service at temperatures up to 750°F., at pressures up to 600 psi., fo single stage or multi-level stage service with up to three separate switching actions. Special units available for more extreme requirements.

MAGNETROL, Inc. Mail the Coupon Now for Full Facts

MAGNETROL, Inc., 2106 S. Marshall Blvd., Chicago 23, Ill. 9

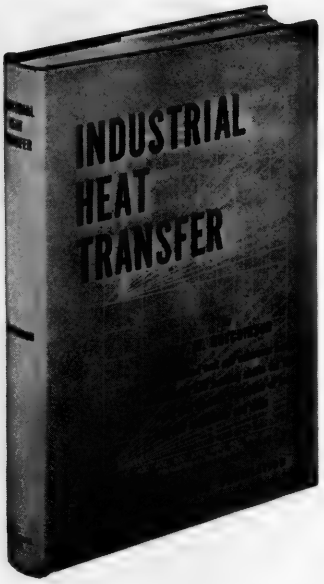
Gentlemen: Please send me Catalog Section III and full information on Magnetrol Boiler Water Level Controls.

Name_____

Company_____

Address_____

City_____ Zone____ State_____



Solve Heat Transfer Problems Directly and Accurately!

INDUSTRIAL HEAT TRANSFER by F. W. Hutchinson, presents 123 working graphs that permit the direct solution of complex problems of heat transfer. Use of these graphs — which are equal in accuracy to the equations from which they are derived — speeds heat transfer analysis and helps to eliminate errors in calculation. In addition to the complete text, graphs are provided for: air, acetylene, ammonia, benzene, chlorine, ethane, ether, helium, oxygen, pentane, steam, sulphur dioxide, water, and 57 other industrially used liquids and gases.

Get your copy of this valuable working reference book today!

336 Pages, 136 Charts and Illustrations — $7.00

In Canada or Overseas, $7.80

ORDER YOUR COPY TODAY!

THE INDUSTRIAL PRESS, 93 Worth St., New York 13, N. Y.

Please send me a copy of INDUSTRIAL HEAT TRANSFER at $7.00.

☐ I enclose payment in full. Send book postpaid.
☐ Bill me ☐ Bill company. (Postage charges will be added)

NAME .....

COMPANY .....

CITY ..... ZONE .... STATE .....

HOME ADDRESS .....

(Please fill in if you want book sent to your home)

ACHV/7/58

NEW CATALOGS

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

STEAM TRAPS—A booklet published by Illinois Engineering Co., Chicago, Ill., describes tests on steam traps conducted by the plant engineer at the Sheaffer Pen Co. plant at Fort Madison, Iowa. Engineer's efforts were to determine whether, for heating or processing, "one trap is as good as another."

Circle **Item 66** on Inquiry Card

AUTOMATIC PACKAGED BOILER — Feature by feature explanation of the advantages of Compact Series automatic packaged boilers, together with complete data, dimensions, and recommended boiler room layout, are given in a 12-page, 3-color brochure by Superior Combustion Industries, Inc., New York, N. Y. Text explains how, by careful engineering, units of unusual compactness have been achieved without sacrificing any of the more desirable features of construction which have been the basis of the company's design.

Circle **Item 67** on Inquiry Card

UNIT VENTILATORS—A new 28-page product bulletin describing Herman Nelson unit ventilators, featuring a Draft/Stop system to control window downdrafts, is introduced by American Air Filter Co., Inc., Louisville, Ky. Bulletin contains detailed information about the unit's component parts such as the pressure equalizing unit, floating heating element, demountable wall intake, automatic back draft damper, air discharge grille, modular fan construction, and slow speed, direct-connected motor. Operation controls are described as well as engineering data for venting, electrical, filter and piping arrangements.

Circle **Item 68** on Inquiry Card

MECHANICAL DRAFT FANS—A catalog, entitled Mechanical Draft Fans, is available from Sturtevant Div., Westinghouse Electric Corp., Hyde Park, Boston, Mass. This catalog describes the efficiency and quietness of airfoil blading for full range applications in three distinct product lines: combustion air forced and induced draft (Series 4000); primary air for pulverized fuel injection (Series 2100); and high-pressure air supply for cyclone furnace boilers (Series 2200). Illustrated with installation photographs, catalog also includes general engineering data on each of these lines.

Circle **Item 69** on Inquiry Card

(Continued on page 134)

weil SUBMERSIBLE SUMP PUMP

The only submersible approved by The Underwriters Laboratories, Inc.

Built for - Automatic Submerged Operation

A PACKAGED UNIT . . . . priced lower than many conventional Sump Pumps

Designed-

TO OPERATE UNDER WATER
Hermetically sealed motor with a leak-proof rotating shaft seal assures dependable performance at all times.

FOR ECONOMICAL INSTALLATION
Is easily installed in a metal tile or concrete sump 2′ to 8′ deep.

FOR SMALL SUMPS
Can be installed thru a 15″ opening.

FOR GAS-TITE INSTALLATIONS

FOR FLOOD-PROOF OPERATION
If current fails moisture cannot damage pump or motor.

Choice OF **3** CONTROLS

MICRO-SWITCH
Fool-proof and trouble-free. Recommended for most installations.

ELECTRODE
For special installations where clear water is being pumped.

FLOAT SWITCH
For Duplex Units. Operates pumps alternately or together as conditions demand.

MOTOR: 1/3 HP, 1750 RPM, 110 volt **CAPACITOR TYPE** with 10 ft. waterproof cable and plug
IMPELLER: Non-Corrosive
SCREEN: Brass
BASE: Heavy duty steel
DISCHARGE: 1¼″
SHAFT: Stainless steel
DIMENSIONS: Height: 12¾″; Diameter: 11″; Weight: 50 lbs.

PERFORMANCE

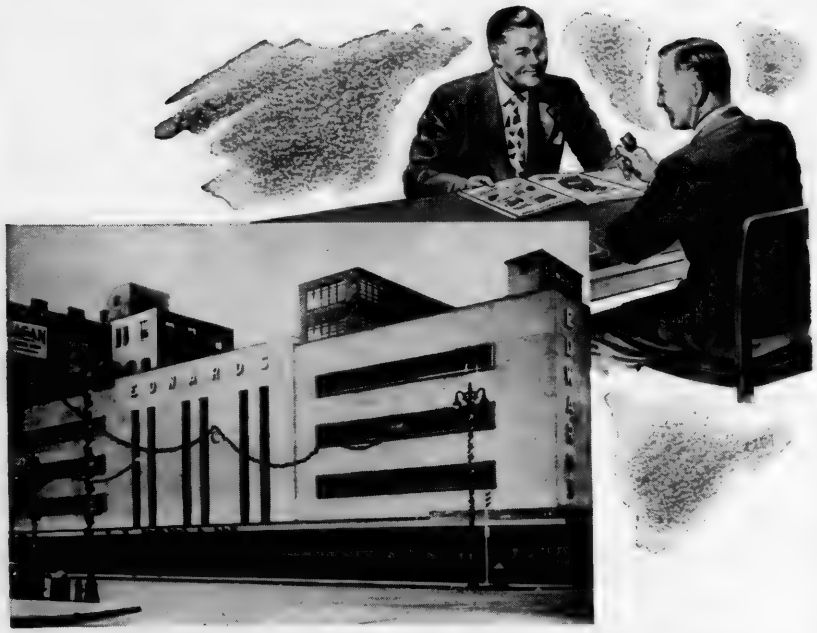
Discharge Head (Ft.)	5	10	15	20	22	24
Capacity, GPH	3600	3350	2400	1830	1160	540

NEW MICRO SWITCH MODEL SS-805 ILLUSTRATED

Engineered for One Million Starts . . . without attention

weil PUMP CO.

1516 North Fremont Street
Chicago 22, Illinois



Deming installation saves $30,000 on water supply for air-conditioning system

Fig. 6700 Turbine Pump for Deep Wells

From Syracuse, N. Y. comes another report on how DEMING PUMPS cut building water costs!

A graphic example of how Deming Pumps provide "profit-performance" is illustrated by a typical Deming planned installation in three multi-story buildings in Syracuse, N. Y. Over 1,500,000 gallons of water are required daily to operate the air-conditioning units in the three buildings. Alert building management consulted with their local Deming distributor in an effort to reduce the high water cost which approached $1,300 a week.

After a comprehensive survey, it was determined that underground water was available in ample volume and of desired temperature, enabling a deep well to be drilled on the property. A 25 HP Vertical Turbine Pump was recommended and installed. Compared with former water costs, the new installation is saving the company approximately $30,000 annually.

For further detailed information on the use of Deming pumps for Air Conditioning service, contact your Deming distributor or write:

THE DEMING CO.

558 BROADWAY • SALEM, OHIO

NEW CATALOGS

(Continued from page 132)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

SAFETY-RELIEF VALVES— Detailed information for the ready selection and sizing of nozzle safety-relief valves manufactured by Farris Engineering Corp., Palisades Park, N. J., is included in a specifications catalog, No. 118. The catalog restricts itself to valves applicable to process piping, and contains a complete data section containing sizing factors and formulae, nozzle capacity charts for air, water, gas and steam, and dimension and weight tables.

Circle **Item 70** on Inquiry Card

PIPE LOCK COUPLINGS— A 4-page catalog describing the Series K ductile iron pipe lock couplings is released by The Kuhns Brothers Co., Dayton, Ohio. Catalog PL-1 presents specific cost-saving advantages of these ductile iron fittings, the pressure ratings for various sizes as listed by Underwriters' Laboratories, Inc., how to install the fittings, and recommendations for their use.

Circle **Item 71** on Inquiry Card

SUN CONTROLS—Permitting the utilization of psychological and functional advantages of glass while effectively minimizing its disadvantages, sun controls are the subject of a 24-page brochure published by the manufacturer, Brown Manufacturing Co., Oklahoma City, Okla. Five basic types of sun controls are described and illustrated in the first few pages, and this section is followed by construction details and application photos of each type. Final pages contain sample specifications for sun controls.

Circle **Item 72** on Inquiry Card

FAN MOTORS—Bulletin No. GEA-6598 from General Electric Co., Schenectady, N. Y., describes the company's complete line of totally enclosed Tri-Clad 55 air-over motors from 7½ to 100 hp for propeller and axial-flow fans. Included are application information, ratings, and dimensions.

Circle **Item 73** on Inquiry Card

REFRIGERATION PRODUCTS — A condensed catalog (81C8b) on the company's refrigeration products for Freon is available from Recold Corporation, Los Angeles, Calif. Catalog states basic information on sizes, ratings, overall dimensions, and approximate shipping weights of 15 different Freon refrigeration products.

Circle **Item 74** on Inquiry Card

DIRECT-FIRED HEAT DIFFUSERS — An informative brochure, No. 46 AF 91, detailing company's new line of direct-fired heat diffusers, is being offered by Carrier Corporation, Syracuse, N. Y. Booklet describes the various installations in which the space heating plant is featured as a low cost central system for schools, churches, warehouses, factories and other large-area buildings. Typical uses of the heat diffuser are shown for heating and ventilating, with air conditioning, for central heating, and in manufacturing processes. A step-by-step formula for selecting the proper capacity unit is included, along with tables showing ratings and physical data, fan performance and resistances of filters and accessories.

Circle **Item 75** on Inquiry Card

CURTAIN WALL INSULATION—A 12-page booklet, entitled Foamglas—The Cellular Glass Insulation for Curtain Wall Construction, is published by Pittsburgh Corning Corp., Pittsburgh, Pa. Booklet outlines the physical properties of Foamglas and recommended specifications. Ten outstanding curtain wall buildings are featured in the brochure. Each case study includes a photograph, general information, job data and a detail drawing of the panel construction.

Circle **Item 76** on Inquiry Card

INDUSTRIAL AIR COMPRESSORS — Ten vital features for reliable industrial air compressors are listed in a specification guide issued by Brunner Div., Dunham-Bush, Inc., Hartford, Conn. The brochure, Catalog No. 37, reveals details of the company's new industrial air compressors in capacities of 25, 30, 40, and 50 hp, single and two stage. Selection data given.

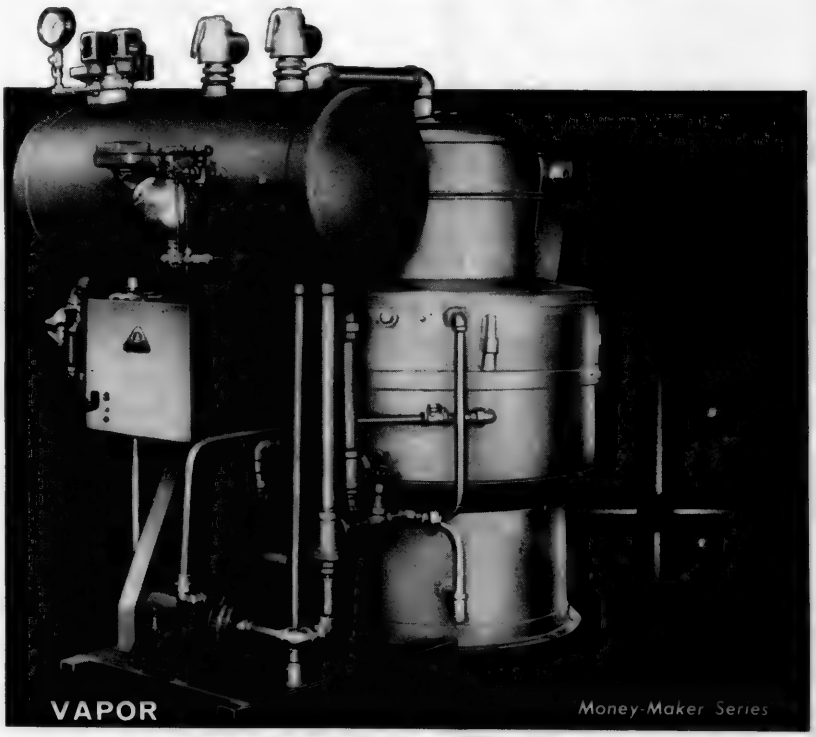
Circle **Item 77** on Inquiry Card

POWER ROOF EXHAUSTERS — An 8-page catalog describing Air-Van direct-connected power roof exhausters is available from Gallaher Company, Omaha, Neb. The catalog presents comprehensive data covering features, performance data, installation methods, and specifications.

Circle **Item 78** on Inquiry Card

AMERICA'S AIR CONDITIONING — Air-Conditioning and Refrigeration Institute announces a new booklet titled Air-Conditioning and Refrigeration — Essential to our Nation's Health, Productivity, Defense. This 26-page booklet was prepared at the recommendation of ARI's Government Relations Committee to depict in a brief presentation how vital mechanical refrigeration and climate control have become to almost every phase of American life, from home air-conditioning and refrigeration to the mammoth installations used in industry and in national defense applications. Copies of the publication are available from ARI, 1346 Connecticut Ave., N. W., Washington 6, D. C., at seventy-five cents per copy.

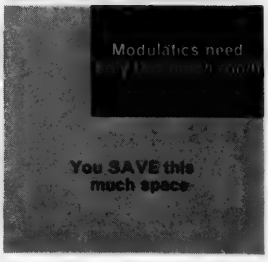
SAVES MORE SPACE THAN IT TAKES UP!...



DRUM MODULĀTIC
WATER-TUBE BOILERS

are SO COMPACT . . . SO EFFICIENT . . . they require only one-fourth the floor space of conventional boilers of comparable ratings!

SEE FOR YOURSELF!



All of this space is required for a conventional boiler.

They save enough space to provide:

- **An extra classroom in schools**
- **An extra ward in hospitals**
- **An extra storage room in hotels**
- **Extra production area in factories**

AT NO EXTRA COST!

Made since 1932 by the nation's oldest manufacturer of package steam boilers

Vapor Drum Modulatic Water Tube Boilers provide 4 BHP per sq. ft. of floor space. Delivered completely assembled and wired. Requires no special foundation, no forced-draft chimney. Can be installed in a few hours, ready for firing. Fully automatic, "push-button" operation. Delivers instant hot water, or full output in 5 minutes from cold start. Oil or gas fired or combination oil and gas. Wide range of models, 20 to 150 hp., 15 psi steam pressure, 670,000 to 5,000,000 btu/hr.

And, Modulatic boilers *never require replacement.* Design permits easy, simple replacement of water-tube coils (or other parts), for lifetime peak efficiency.

It will pay you to get the facts. Send the coupon now for complete information.

VAPOR HEATING CORPORATION
80 East Jackson Boulevard
Dept. 27-G
Chicago 4, Illinois

Please send Bulletin 475 on Vapor Drum Modulatic Water-Tube Boiler

Name_____

Company_____

Address_____

City, Zone, State_____

for FUME

CONTROL

install

FLEXAUST®

HOSE

Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of fume and dust control, and ventilation uses.
Extremely flexible, durable, and lightweight.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Sizes 1¼" thru 36" i.d.

Write for details today
Distributors
in all principal cities

THE FLEXAUST COMPANY
Dept. HV-7
AVE NEW YORK 17 N Y

NEW CATALOGS

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

MOTOR APPLICATION GUIDE— Century Electric Co., St. Louis, Mo., has issued Form 270, a 12-page 1958 motor application guide. The operation of matching motor characteristics and load requirements has been simplified in this guide, which also gives details on the company's complete line of polyphase, single phase, and direct current motors in sizes from 1/20 to 400 hp.

Circle **Item 79** on Inquiry Card

COUNTERFLOW COOLING TOWERS— Counterflow, induced draft cooling towers for industry are the subject of a 14-page brochure available from the manufacturer, J. F. Pritchard & Co. of California, Kansas City, Mo. Drawings and photos illustrate construction and mechanical features of the towers which are manufactured in four basic series, dimensions of which are given.

Circle **Item 80** on Inquiry Card

STEEL TUBING—Bulletin 12-10, published by Joseph T. Ryerson & Son, Inc., Chicago, Ill., features simplified selection chart which provides data including characteristics, size range, response to fabrication, and relative cost of seamless and welded, mechanical and structural, carbon steel tubing. Condensed information is also given on stainless steel and aluminum tubing and pipe, and plastic pipe.

Circle **Item 81** on Inquiry Card

MANUAL ARC WELDING—Lenco, Inc., Jackson, Mo., manufacturer of Hi-Amp welding accessories, has published a 24-page booklet, entitled Reducing Costs By Proper Care Of Arc-Welding Circuits. This publication is written in non-technical language, and points out many things that can be done to keep electric arc-welding circuits operating properly.

Circle **Item 82** on Inquiry Card

PERFORATED METALS—The Harrington & King Perforating Co., Inc., Chicago, Ill., announces publication of 156-page General Catalog No. 75 on perforated metals. Over 30 pages are devoted to illustrating general uses of perforated metals. Included in the product description section are grilles, registers, and louvers. Engineering tables complete the book.

Circle **Item 83** on Inquiry Card

(Continued on page 138)

w-h-o

Who has the most complete line of instruments for temperature, pressure and humidity?

Who is the instrument manufacturer famous for 100% inspection of virtually every item in its line?

Who has the lowest pricing consistent with top quality?

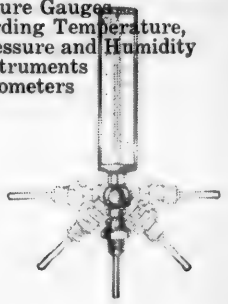
Who is the instrument manufacturer with employee relations second to none in the industry, providing assurance to customers that every product is the result of skill plus enthusiasm?

Who has 5 instrument catalogs to cover laboratory or industrial needs...and everything between?

It's WEKSLER...remember the name!

Tell us your instrument requirements. We'll send you the information you need.

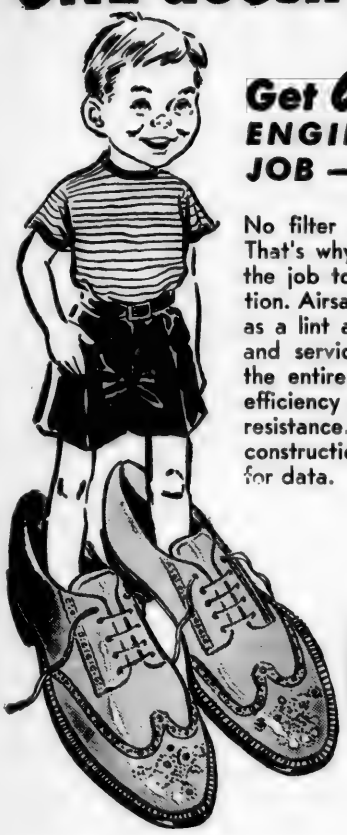
General Purpose Thermometers
Laboratory Thermometers
Industrial Liquid-in-Glass Thermometers
Dial Indicating Thermometers
Pressure Gauges
Recording Temperature, Pressure and Humidity Instruments
Hydrometers



WEKSLER INSTRUMENTS

WEKSLER INSTRUMENTS CORP.
FREEPORT, L. I., NEW YORK

ONE doesn't fit ALL needs!



Get *Airsan* Filters
ENGINEERED TO FIT THE JOB — RIGHT EVERY TIME

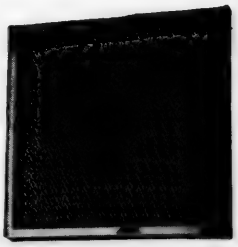
No filter does all jobs, meets every need. That's why Airsan Filters are engineered to the job to offer more effective dust collection. Airsan's expanded metal face plate acts as a lint arrestor to provide easier cleaning and servicing. It distributes air easily over the entire filter area. Provide high filtering efficiency and dust holding capacity with less resistance. Features include all galvanized construction and welded lock corners. Write for data.

Send for Free Bulletins

AFI MEMBER AIR FILTER INSTITUTE

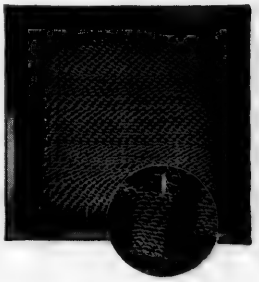
AIR FILTERS
(Low Velocity)

Viscous type, permanent and cleanable designed for industrial, commercial and domestic use. Available in 1" and 2" thickness.



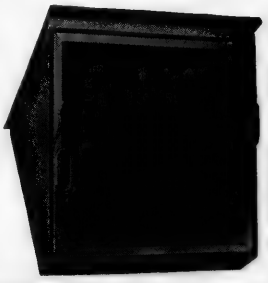
VIRO-CRIMP
(High Velocity)

Has a specially designed high velocity Viro-Crimp filter core. Hemmed edges provide a safety feature. Operates efficiently at 300 to 500 fpm. Available in 2" and 4" thickness.



GREASE FILTERS

Permanent, cleanable type Airsan Grease Filters made especially for range canopies, galleys, kitchens. Available in 2" thickness.



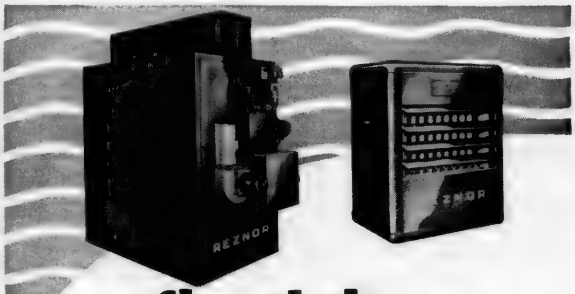
Air Filter Corporation

4554 S. West Woolworth Ave. • Milwaukee, Wis.

Canadian Representative

DOUGLAS ENGINEERING CO., LTD., TORONTO

A Few Distributorships Available. Write for Details!



flexibility

When you're faced with the choice of specifying a boiler which is oversized for initial steam heating requirements or one which won't have the reserve capacity to heat possible future additions, the best solution is a switch to Reznor gas unit heaters. As a building grows, a Reznor heating system grows with it, easily and efficiently. As more space is added, more heaters can be installed. It's as simple as that.

FLEXIBILITY is only one of many reasons why Reznor gas unit heating is right for so many of your commercial and industrial jobs. Ask your Reznor distributor for the complete story or write for your copy of "Modern Heating".

Look for Reznor under "Heaters-Unit" in the Yellow Pages

REZNOR
WORLD'S LARGEST SELLING DIRECT FIRED
UNIT HEATERS

Reznor Manufacturing Company, 64 Union Street, Mercer, Pa.

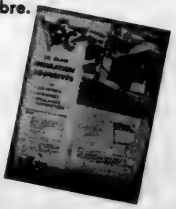
Bond Insulation PERMANENTLY with

ST. CLAIR
Specially Formulated Insulation Adhesives

ST. CLAIR Insulation Adhesives provide excellent coverage, high heat resistance and easier handling of insulation which can be bonded immediately or up to 45 minutes after applying adhesive.

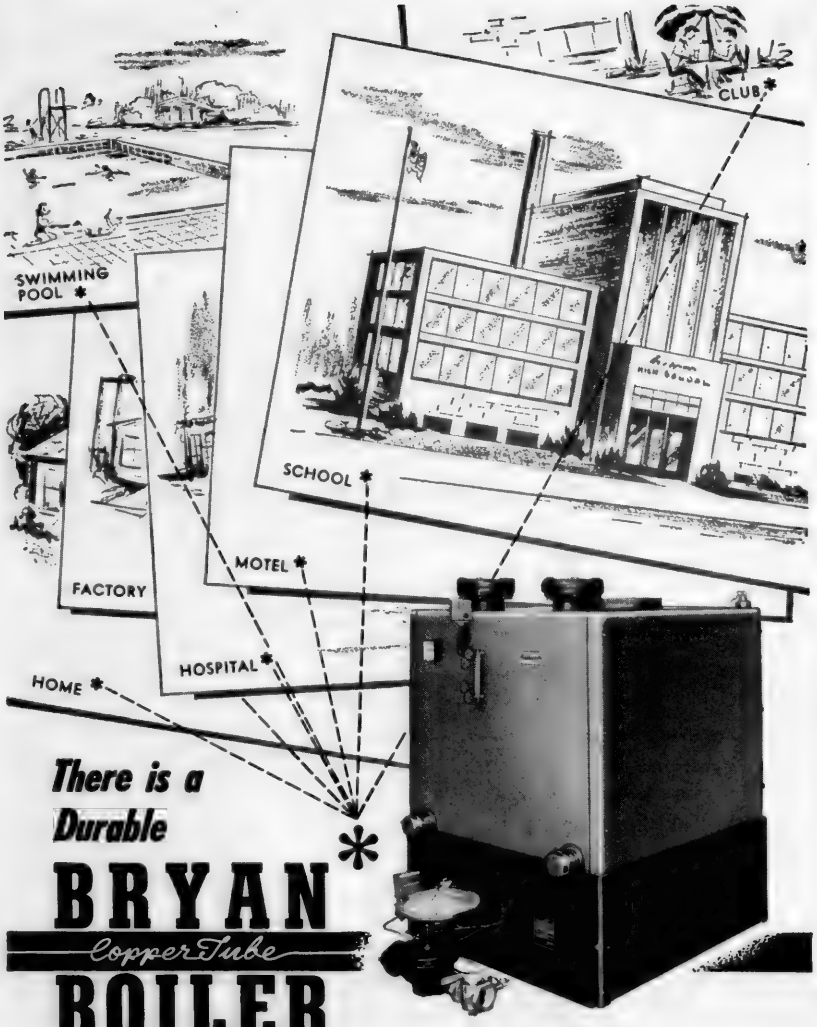
These insulation adhesives afford fine results for bonding insulation to ducts. They supersede pins and clips, wires, screws, and caps, because they save on installation cost while providing a better, neater and more permanent bond.

ST. CLAIR also produces clear and white adhesives for bonding lap seams on pipe insulation—also other adhesives for applying foil and vinyl facings to glass fibre.



Send for Free Sample & Catalog

ST. CLAIR RUBBER CO.
440-C E. JEFFERSON AVE. • DETROIT 26, MICH.



There is a Durable

BRYAN

Copper Tube

BOILER

For every steam or water heating application up to 1,800,000 B.T.U. output.

Whether the plans on your boards are for a factory, apartment house, swimming pool or a modest radiant heat home, a detailed check on specifications will point to one of the many Bryan models covering low or high pressure steam, hot water boilers, or indirect water heaters.

The Bryan is a heavy duty, durable boiler made to deliver a lot of B.T.U's in a short period of time. Specially engineered for gas or oil heating, its high efficiency is complemented by years of trouble free service. Requires minimum floor space.

Bryan is the originator of the famous Bryan copper tubes. They are used in both direct and indirect heating units for fast action and elimination of scale deposits.

Bryan Gas Fired Boilers are designed and built to the requirements of the A.S.M.E. code and are also approved by the American Gas Association (A.G.A.)

Send For Technical Information • 2100 Chili Pike

BRYAN STEAM CORPORATION • Peru, Indiana

NEW CATALOGS

(Continued from page 136)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

DEMINERALIZATION— Graver Water Conditioning Co., New York, N. Y., announces a newly revised and enlarged bulletin, WC-111A, on demineralization (ion exchange). In addition to several basic sections on the application of demineralizers, their basic principles of operation, and the chemistry of ion exchange resins, this bulletin includes detailed information and charts on materials of construction and the design of component parts.

Circle **Item 84** on Inquiry Card

DRAFTING TEMPLATES — Offered by Way-Mac Manufacturing Co., Los Angeles, Calif., is a 14-page catalog and price list covering its line of drafting templates. Templates contain symbols and elements pertaining to almost every field and function, including electrical, mechanical, architectural, structural, and mathematical. Of special interest to readers is a heating and air conditioning drafting template.

Circle **Item 85** on Inquiry Card

AIR CONDITIONERS, FURNACES — Three specification sheets are available from Armstrong Furnace Co., Columbus, Ohio. No. S-70 contains information on Frigipak Models 2 and 3, the single-unit and split-system air conditioners developed for the 1958 season. No. S-71 has specifications for the entire line of summer air conditioning equipment, and includes Models 2, 3, and 5. No. S-72 is concerned with the company's gas and oil-fired commercial and industrial furnaces.

Circle **Item 86** on Inquiry Card

INDUSTRIAL INSULATIONS—The thermal, mechanical and physical, and chemical characteristics of its complete line of industrial insulations is comprehensively presented in a catalog published by Baldwin-Hill Co., Trenton, N. J. Catalog includes data on high temperature spun-mineral wool insulating block, blankets, pipe coverings and cements and on mineral wool industrial felts and duct installation. Thermal conductivities and tables of recommended thicknesses of each material are given for appropriate temperature ranges. Illustrated application instructions included.

Circle **Item 87** on Inquiry Card

(Continued on page 140)

Have You This Latest Bulletin K-1204?

Here is the ideal space-saving economical and ultra sanitary wash fixture for schools, institutions, commercial, public and factory buildings—the Bradley Duo-Washfountain. Nationally advertised and widely accepted.

Write for free copy of this new Bulletin K-1204. BRADLEY WASHFOUNTAIN CO., 2352 W. Michigan St., Milwaukee 1, Wis.

BRADLEY *Duo Washfountains*

Distributed Through Plumbing Wholesalers

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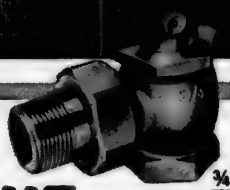
low-cost

HEAT ZONING



with
easy-to-install

ZONVALVE

¾" I.P.S. shown

Now – the comfort of multiple-zone heating at a fraction of the former cost. ZONVALVE, new thermostatically-controlled motorized valve, replaces ordinary radiator valve *without plumbing change*. On new installations, ZONVALVES can be used on radiators or branch lines.

ZONVALVES are made in all standard pipe and tubing sizes. *Low wiring cost* – because motor operator is low voltage. All ZONVALVES equipped with auxiliary switch to start burner or circulator when open.

ZONVALVE is designed for steam and hot water systems. *Unconditionally guaranteed.* Ideal for private homes, factories, office buildings, hotels and motels.

for details write to **HEAT-TIMER CORP.** DEP'T. D-6
657 BROADWAY, NEW YORK 12, N. Y.

ACCURATE TEMPERATURE READINGS

- **Hot Water Systems**
- **Floors, Walls, Ceilings**
- **Refrigerated Coils**
- **Insulation**
- **All Other Low Temps.**

You can accurately read any low surface temperature with the Alnor Type 2300 Surface Pyrometer—in 3 to 5 seconds.

Take this rugged, portable instrument to any job in the field and see how performance to laboratory standards can save invaluable time in balancing out a system...save the money lost on call-backs. Large 6" mirrored scale is direct reading, no conversion...no errors in readings ..1° per division. Precision jeweled movement is protected against abuses of portable service by sturdy walnut case. Comes complete with matched thermocouple and lead ready to use on your next trip out. Send for Bulletin 4257 and get the complete story on the full line of Alnor Pyrometers. Just tear out this ad and mail on your letterhead to: Illinois Testing Laboratories, Inc., Room 514, 420 N. LaSalle St., Chicago 10, Ill.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

ONLY ELOF HANSSON'S NEW

UNI-SILENCER

REG U S PAT OFF

for Air Conditioning Systems

is produced to meet 3 specifications in acoustical efficiency and only UNI-SILENCER* data is guaranteed in writing!

Typical UNI-SILENCER* installation at 100 Broadway, New York City, N. Y.

Efficient, compact and streamlined, UNI-SILENCERS* and UNI-RESONATORS* are designed specifically to reduce the airborne noise generated by fans in air conditioning and industrial ventilating systems.

NOW PRODUCED IN THREE MODELS!

Model

LPD—**FOR LOW PRESSURE DROP** *(moderate acoustical efficiency)*

A—**FOR MEDIUM PRESSURE DROP** *(standard acoustical efficiency)*

B—**FOR HIGHER PRESSURE DROP** *(maximum acoustical efficiency)*

ALL 3 MODELS HAVE WRITTEN GUARANTEES ON CERTIFIED PERFORMANCE DATA AND ARE SOLD AT THE SAME LOW PRICE!

When air flow, pressure drop, or noise attenuation require the use of more than one Uni-Silencer, then all the units (singles, halves or quarters) may be set together using built-in slip joints. Thus in series or in parallel, Uni-Silencers will fit any condition or requirement (see cut below).

MODULAR DESIGN 3 Uni-Silencer singles and 3 half units set together

UNI-SILENCERS* are supplied in 3 sizes. Single Unit—24x24x32"; Half Unit—12x24x32"; Quarter Unit—12x12x32" and are delivered in cartons weighing about 75 lbs. each. They may be easily and inexpensively transported into the building, to the specific location required.

FREE complete engineering service!

*Reg. U.S. Pat. Off.

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711 THIRD AVE., N.Y. 17, N.Y., Dept. U2-JY

Please send complete literature on performance-guaranteed Uni-Silencers and Uni-Resonators, without charge or obligation.

NAME .....

ADDRESS .....

CITY .....ZONE...STATE.....

NEW CATALOGS

(Continued from page 138)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

HIGH VELOCITY DUAL-DUCT SYSTEMS—Complete reference material on the design, layout, and installation practice for high velocity dual-duct systems is available from Buensod-Stacey, Inc., New York, N. Y. Prepared by N. S. Shataloff, engineering consultant for Buensod-Stacey, and reprinted from the April and May issues of AIR CONDITIONING, HEATING AND VENTILATING, the twenty-four page illustrated and diagrammed article is the first published describing high velocity dual duct systems for multi-zone installations. Advantages and disadvantages, problems and answers associated with particular applications are covered. Construction details for rectangular high pressure ducts and design procedures are included with practical information of value both to the design engineer and contractor.

Circle **Item 88** on Inquiry Card

AIR CONDITIONING SERVICE—A revised, pocket-sized, trouble-shooting guide for cooling, called The Janitrol Road Map for Air Conditioning Service, is published by Janitrol Heating and Air Conditioning Div., Surface Combustion Corp., Columbus, Ohio. It will speed up diagnosis of the most prevalent types of troubles through the use of a check chart which outlines solutions to 52 symptoms.

Circle **Item 89** on Inquiry Card

CHEMICAL TREATMENTS—A brochure describing the company's complete line of products for chemical treatment of boiler water, steam, cooling water, and fuel oil is announced by Chemical Testing Corp., Long Island City, N. Y. Besides describing specific products and their recommended application, the brochure discusses the general subject of chemical treatments, and includes an interesting page on the subject of "gadgets."

Circle **Item 90** on Inquiry Card

METERS FOR LIQUIDS, GASES—Two accurate and economical meters, the Propeloflo for liquids and the Shuntflo for air, steam or gases, are the subject of Bulletin No. 100-R1 issued by Builders-Providence, Inc., a division of B-I-F Industries, Inc., Providence, R. I. The six-page bulletin provides photographs, line drawings, cutaway views, and technical data tables to supplement the explanatory text.

Circle **Item 91** on Inquiry Card

MODERN VENTING—A brochure on venting has been published by Gas Vent and Chimney Division of the Gas Appliance Manufacturers Association, New York, N. Y. Titled Modern Heating Demands Modern Venting, publication details the functions of the Type B gas vent and the factory built chimney. Brochure points out that seven out of ten new homes are heated with gas and that the established efficiency of gas heating can be enhanced with vents or chimneys scientifically designed for the purpose. It also states that substantial building economies can be effected.

Circle **Item 92** on Inquiry Card

AIR DIFFUSERS—Announced by Titus Manufacturing Corp., Waterloo, Iowa, is a 20-page catalog which gives full details on the company's new line of Series TMD square and rectangular air diffusers. A comprehensive engineering section makes the correct selection of these diffusers for any application fast and easy.

Circle **Item 93** on Inquiry Card

WELDING FITTINGS, FLANGES—Those responsible for the procurement of welding fittings and flanges will benefit by the information contained in a 4-page folder released by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. This folder, known as Bulletin FB-503, explains the proper ways to prepare the requisition or order for welding fittings and flanges.

Circle **Item 94** on Inquiry Card

ANHYDROUS AMMONIA—A technical bulletin on commercial and refrigeration grades of anhydrous ammonia is available from Sun Oil Company, Philadelphia, Pa. Bulletin contains information on physical-chemical properties, specifications, and the company's shipping and service facilities. A brief list of uses for anhydrous ammonia is included.

Circle **Item 95** on Inquiry Card

CLAMPS FOR PLASTIC PIPE— A convenient chart for selecting at a glance the proper size of clamp for three classes of plastic pipe in all sizes from ½ to 6 inches has been issued by Wittek Mfg. Co., Chicago, Ill. This chart is suitable for wall or desk use.

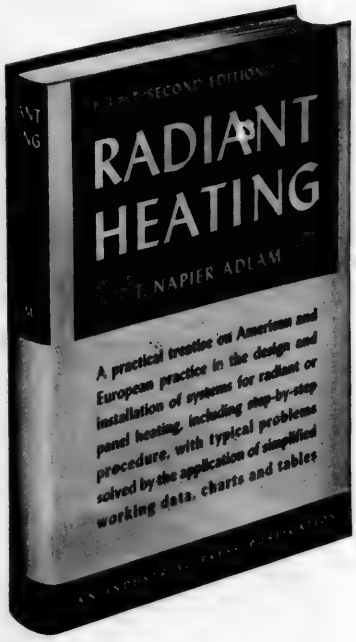
Circle **Item 96** on Inquiry Card

RAM BENDING—Published by Wallace Supplies Mfg. Co., Chicago, Ill., is a 16-page booklet describing the company's wide-range line of ram benders for pipe, tube, or structural shapes. All units are illustrated, and specifications are given, including each unit's range of bending capacity.

Circel **Item 97** on Inquiry Card

(Concluded on page 142)

Here is a Book That Gives You All the Answers!


RADIANT HEATING
T. NAPIER ADLAM
A practical treatise on American and European practice in the design and installation of systems for radiant or panel heating, including step-by-step procedure, with typical problems solved by the application of simplified working data, charts and tables

What do you want to know about radiant heating? Here is a book that gives you the answers — the right answers—written by an outstanding authority on the subject. "Radiant Heating" by T. Napier Adlam, provides basic information plus working data necessary to design and install efficient systems . . . covers radiant heating with ceiling, wall and floor panels, using all types of fuels . . . shows step-by-step procedure in laying out systems, using simplified charts that give most of the essential data without calculation.

If you want authoritative answers to radiant heating questions, you'll find time-saving, money-saving solutions to your problems in this book. Send for your copy today!

504 pages **$6.00** 337 illustrations

Published by

THE INDUSTRIAL PRESS

93 Worth St.

New York 13, N. Y.

CLASSIFIED ADVERTISING

Sold at $12 per column inch.

PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply BURNER SERVICE form in 8 part EZE-SNAP with 2 carbons in each set, 1200 sets IMPRINTED with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N. Y.

MANUFACTURERS' AGENTS

An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturer's agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.
Please reply Box 914, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

WANTED MECHANICAL ENGINEER for architectural and engineering office to do design of heating, ventilating, air conditioning, power plant, piping. Must have consulting office background and minimum of 8 years experience. Box 925, Air Conditioning, Heating and Ventilating, 93 Worth St., New York 13, N. Y.

TECHNICAL TRAINING REPRESENTATIVE

National manufacturer of heating, air conditioning and water heating equipment requires two product training men to work with sales force and customers. Sales personality with background in one or more of the above products required. Age 28 to 40. Locations: Dallas, Texas and Oakland, California. Limited travel. Write Box 926, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

WANTED MAN:

30 to 35 years, experienced Steam Boilers or Water Heaters to join main office in Chicago. Well known National Manufacturer. Give full details education, experience, marital status and other pertinent details. Write Box 927, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

"Mechanical Engineer—BME—PE—age 33, Chief Engineer with New York City Consulting Engineer desires to relocate to southern California. Seeking top level position with large firm of architects or consulting engineers. Twelve (12) years' high calibre experience with architects, engineers and contractors, in responsible charge of design and construction of air conditioning, refrigeration, heating, ventilating and plumbing systems for commercial, institutional and industrial buildings." Write Box 928, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

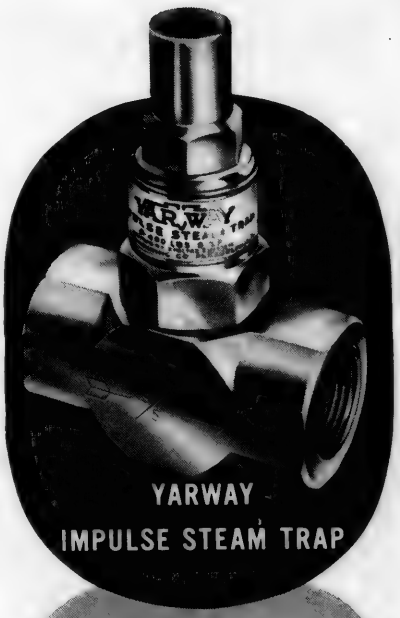
MANUFACTURERS REPRESENTATIVES

This magazine has many requests from manufacturers seeking representatives to handle their line of products. Why not register your name and lines desired with us and thereby be eligible for additional contacts? Write to Suno Larson, Research Director.

Air Conditioning, Heating & Ventilating
93 Worth St. New York 13, N. Y.

HEATING AND COOLING need CHIEF ENGINEER

Must be experienced in the design, production and manufacturing of baseboard, finned tube radiation, convectors, unit heaters, cabinet heaters and combination chilled and hot water units. We must have a man with drive and imagination; ample opportunity for expressing ingenuity toward design, economical production and manufacturing. Our organization is young, aggressive, and one of the leaders in the heating field, looking forward to a complete line of highest quality products kindred to heating and air conditioning. Excellent compensation and steady advancement for a go-getter. Please submit in writing qualifications and other pertinent information.
C. G. Newton
KRITZER RADIANT COILS, INC.
325 North River Street
Batavia, Illinois



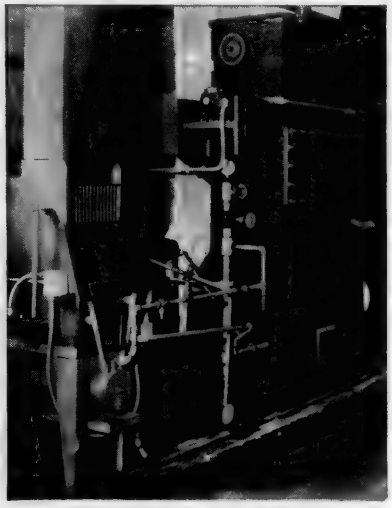
a good team for steam

This Yarway team has scored high—over a million installed on all types of steam equipment. Stocked and sold by 270 Industrial Distributors. For free Steam Trap Book, write YARNALL-WARING CO., 104 Mermaid Ave., Philadelphia 18, Pa.

go YARWAY with confidence

EXACT CONTROL

of Moisture Content To Improve your Product or Protect Your Materials or for Processes or Tests



● This Niagara Air Conditioning Method dries air directly and measurably, using a moisture-absorbing liquid spray. It makes humidity control a separate function from lowering or raising temperatures and gives you precise control with thermostats alone; no moisture-sensitive devices are needed. You have simpler, more trustworthy, less expensive control instrumentation. Niagara precise-control installations have the best record for reliability.

Niagara Air Conditioning provides you with any temperature and relative humidity you need. Using "Hygrol" absorbent, it is not expensive to operate, saving the refrigeration commonly used to condense moisture and making re-heat unnecessary in most cases. It gives large capacity with compact, easily-maintained equipment. Ask for descriptive Bulletins No. 112 and No. 121.

NIAGARA BLOWER COMPANY

Dept. HV-7, 405 Lexington Ave.

New York 17, N.Y.

District Engineers

in Principal Cities of U. S. & Canada

NEW CATALOGS

(Concluded from page 140)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

COMMERCIAL WATER HEATER — Literature and specifications on the B-97 Burkay commercial water heater are available from Permaglas Division of A. O. Smith Corp., Kankakee, Ill. The automatic gas-fired, glass-lined, storage and circulating tank water heater has an input of 97,000 Btu per hr and a 70-gal storage capacity with an 81½-gph recovery at 100 deg temperature rise.

Circle **Item 98** on Inquiry Card

AIR CONDITIONING CONTROLS — A condensed catalog of mechanical cooling and air conditioning controls is published by Penn Controls, Inc., Goshen, Ind. Several new listings are shown in addition to the broad line of controls previously cataloged. The Series 246 all-range water valves, for both Refrigerant 12 and 22 applications, are shown for the first time. Also making an initial appearance is Series 3246, 3-way water valves for cooling tower applications.

Circle **Item 99** on Inquiry Card

AIR FILTERING PRODUCTS — Owens-Corning Fiberglas Corp., Toledo, Ohio, has available a 4-page publication describing and illustrating air filtering products for commercial and industrial applications. The publication contains eight illustrations of the standard filters for air conditioning and heating units, and those for other commercial and industrial uses.

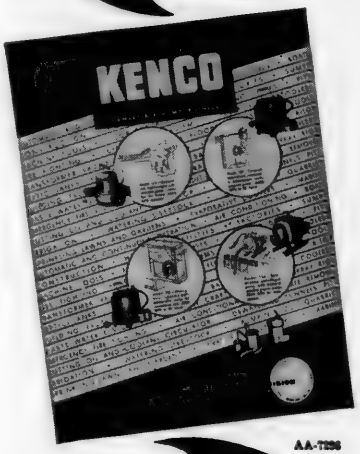
Circle **Item 100** on Inquiry Card

PACKAGED SILENCERS—A catalog describing the company's complete line of Quiet-Duct silencers for air conditioning and ventilating systems is issued by Industrial Acoustics Co., New York, N. Y. Catalog is a complete presentation of the use of packaged silencers, and data are included on the proper methods used in selecting correctly sized silencers to achieve the desired noise control.

Circle **Item 101** on Inquiry Card

PIPE-SPECIFICATION WALL CHART— Users of steel pipe are offered (by request on company letterhead) a helpful schedule chart prepared by Midcontinent Tube Service, Inc., 2120 Lee St., Evanston, Ill. Chart, measuring 17 x 22 inches, is printed for top visibility, reproducing all essential pipe-specification information of wall thicknesses, weight, and outside diameter of seamless and welded steel pipe under ASA schedules from ⅛ to 24 inches.

KENCO means **MORE PUMP PROFITS**



AA-7226

NEW CATALOG Shows You HOW!

First and still Finest In Submersible Pumps

KENCO

For the Home
For Industry
For the Farm
For Emergencies
For Boats

Write today for Catalog

KENCO PUMP DIVISION

The American Crucible Products Co.

1303 Oberlin Avenue
LORAIN, OHIO

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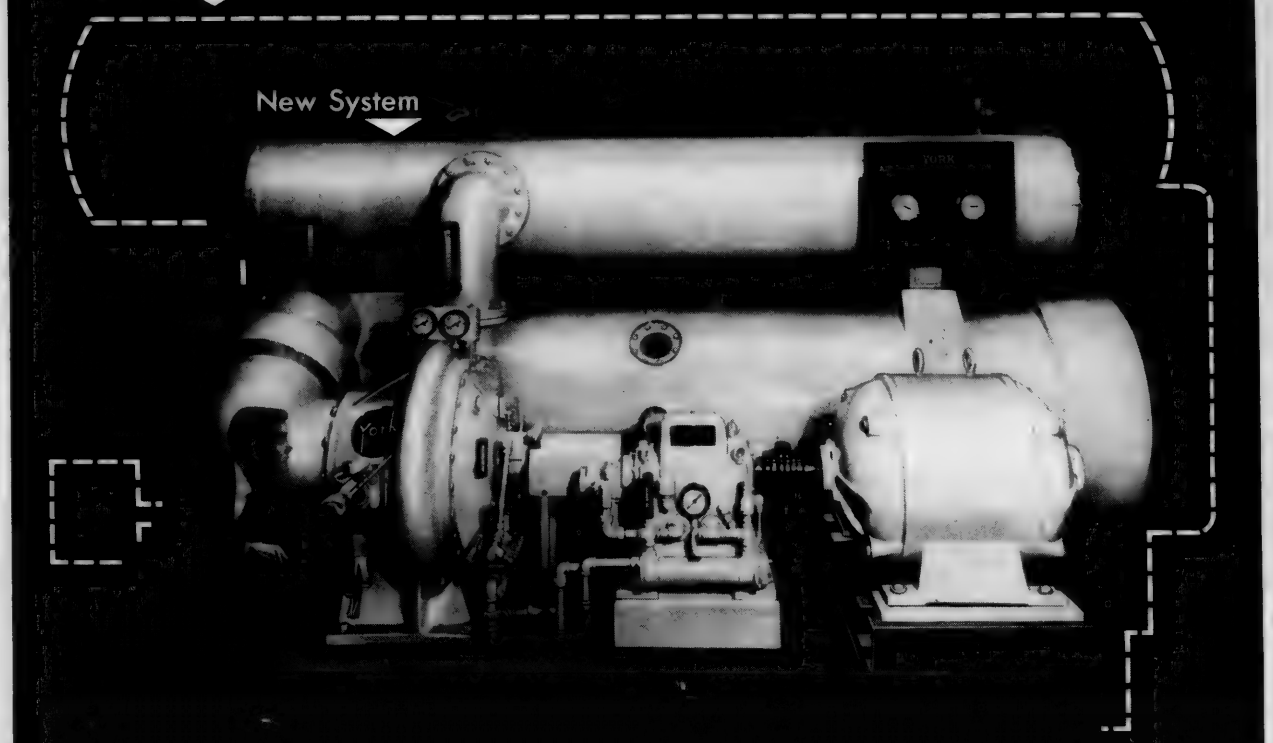
HUGHES PRINTING CO.
EAST STROUDSBURG, PA.

ANOTHER AIR-CONDITIONING VALUE PACKAGE FROM YORK



TURBO WATER COOLING SYSTEM

- **Number of parts and deadweight cut as much as 400% over previous models!**
- **Widest range of capacities: 100 to 600 tons . . . with single-stage simplicity!**
- **Completely automatic adjustment for all load conditions insures long-run economies!**
- **Quiet, vibration-free operation!**
- **Any prime mover can be used!**

These are features that consulting engineers and contractors have long sought, and now make York's single-stage Turbo Systems an *engineered value* unmatched in the air-conditioning industry:

EASIER INSTALLATION! These compact, lightweight systems require no special foundations; occupy a minimum of space. The advanced single-stage compressor out-performs multi-stage systems twice its size . . . and does away with such equipment as flash coolers, extra float valves, extra piping and its insulation.

MORE ECONOMICAL PERFORMANCE! Stable operation under all load conditions is assured. York Turbos can be run completely by automatic capacity control . . . without supervision. Complicated control devices have been eliminated. There are no oil pumps to start.

SIMPLIFIED MAINTENANCE! The York Turbo is more nearly hermetically-sealed than any other centrifugal system. Contamination of the refrigerant is positively prevented. The use of a lightweight aluminum rotor (the only moving part)—and a small, flexible shaft coupling reduces wear. All running parts are removable as a package for inspection . . . are readily accessible without disturbing refrigerant connections!

These important features are the direct result of York's tradition of designing with the *real cost* of air-conditioning in mind. They are just a few of the many you and your clients may want explained in detail. Check your classified directory for your local York factory representative . . . or write York Corporation, York, Pennsylvania.

YORK
CORPORATION
SUBSIDIARY OF BORG-WARNER CORPORATION
IN CANADA: CANADIAN ICE MACHINE COMPANY LTD., TORONTO

Millions Live Better with York

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement.

NOTE: All advertisements are digested here except those received too late for inclusion. The index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

TEMPERATURE REGULATORS ..... offer the surest way to keep temperatures from getting out of control. Self-contained and completely automatic regulators control liquid temperatures with an accuracy never before achieved. Literature is available.
Inside Front Cover — Item 200

INVERTED BUCKET STEAM TRAPS... solve vacuum loss for Detroit's Masonic Temple. Steam heated cooking equipment in kitchen couldn't meet dinner schedules. Kettles heat in a hurry now. 44-page steam trap book plus two reprints are available.
Page 1 — Item 201

AIR-COOLED CONDENSER..... won't rock, rattle or roar because engineers planned it that way. Condensers, available in 12 models, are dependable, too. Information is available.
Page 2 — Item 202

PUMPING EQUIPMENT..... is installed in the new Inland Steel Building in Chicago for heating, snow melting, and domestic hot water circulation. Literature is available.
Page 5 — Item 203

REFLECTIVE INSULATION..... when installed in a normal fashion with some small percentage of openings which permit air to pass through, will not permit condensation to occur in wooden floors over crawl spaces. National Bureau of Standards booklet on reflective insulation is available.
Page 7 — Item 204

FREE CADDY WRENCH..... is offered with purchase, from June 1 to August 1, of cylinder of this company's very dry refrigerant. All purpose wrench is also a carrying tool. Information on refrigerants available.
Page 9 — Item 205

REVOLVING UNIT HEATERS..... eliminate hot blasts and cold starts because the warm air outlet rotates slowly and continuously. Fewer heaters are required due to wide throw. Information is available.
Pages 12-13 — Item 206

DISC EQUIPPED BRONZE VALVES.... offer top value in every component. For example, factor of safety in wall thickness of high tensile bronze body is many times higher than rating requires. Descriptive folder is available.
Page 15 — Item 207

TRIPLE-FUEL DRAFT CONTROL..... for industrial gas-fired furnaces and boilers are the subject of a removable reference sheet. Performance comparison tells when and why to specify controls. Information is available.
Insert bet. 16-17 — Item 208

SEAMLESS STEEL PIPE ..... was used in the installation of a new air conditioning system for one of Chicago's landmarks, the towering Field Building on South LaSalle St. Information is available.
Page 17 — Item 209

PNEUMATIC CONTROL CENTERS..... are designed with any combination of features required to provide efficient air conditioning operation. Pneumatic system is easy to operate and maintain. Information is available.
Pages 18-19 — Item 210

GAS AIR CONDITIONING..... keeps customers cool and operating costs down at the Motel Washingtonian near Washington, D. C. Information on cooling with gas is available.
Pages 20-21 — Item 211

PROPER THERMAL ENVIRONMENT... is provided by the manufacturer's air conditioning control systems at the modern IBM plant at Kingston, N. Y. Employees think and work better in a controlled environment. Information available.
Pages 22-23 — Item 212

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information

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PLEASE PRINT — July H-59

This service available only to U.S. and Canadian readers.

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

NEW WROUGHT IRON.....
developed by the manufacturer is making news throughout the country. Increased corrosion resistance is providing longer service life at lowest cost per year. Details are available.
Pages 24-25 Item 213

WATER COOLING MACHINES.....
in a full line of completely packaged units are offered by this manufacturer with capacities ranging from 5 to 139 tons. All are pre-engineered, assembled and tested for a perfectly balanced refrigeration cycle. Information is available.
Pages 26-27 Item 214

PRECISION-BUILT FANS.....
in a complete line from this manufacturer offer an economical solution to your air moving problem whether it be heating, ventilating, drying or processing. Information is available.
Page 28 Item 215

PERFECT SUPPORT.....
is offered modern, sanitary wall-type plumbing fixtures with this manufacturer's engineered wall-type supports. They are slimmer, stronger, and easiest to install. Catalog is available.
Page 29 Item 216

WINDOWLESS BUILDING.....
relies on this company for air conditioning and ventilation. Eight central plant and multi-zone air conditioning units are utilized. Information is available.
Page 30 Item 217

MOTOR STARTERS.....
for air conditioning service offer rugged simplicity. Simple, durable contactors assure continuous service. Information is available.
Page 31 Item 218

SHOWER MIXING VALVE.....
is thermostatically controlled for the safest, most comfortable showering. There are no protruding edges to injure, no chance of accidental scalding. Information is available.
Page 32 Item 219

SUPER-QUIET BALL BEARINGS.....
applied to the blower shaft mountings of the Lennox Landmark year-round conditioner provide whisper quiet service which is as much a comfort feature as the "Made to measure" heating and cooling. Bulletin is available.
Page 33 Item 220

CONDENSATE PUMP AND RECEIVER
features quiet, vibrationless operation, low return and easy accessibility. Dependable under all types of conditions and continual service. Operates at a wide range of pressures. Information available.
Page 34 Item 221

MULTI-ZONE AIR CONDITIONERS....
will heat and cool simultaneously as outside weather conditions or inside requirements make necessary. Patented high heat transfer coils. Information available.
Page 35 Item 222

WARM AIR SPACE HEATING.....
is accomplished by the manufacturer's heater which gives the kind of performance possible only in a heater in which every part has been designed and built to function as an integrated unit. Bulletin is available.
Pages 36-37 Item 223

ENCLOSED COOLING TOWER.....
complements modern architecture. It is designed to conceal fan, mechanical equipment and air intake area. Even piping is out of view. Bulletin is available.
Page 38 Item 224

COPPER TUBE FITTINGS.....
are available in a new orange and black carton which is designed for your convenience. Carton serves as a handy container, and is clearly indicated as to type of fitting contained. Catalog is available.
Page 39 Item 225

COMMERCIAL GAS BOILER.....
offers dependable hydronic heating at low operating cost. Cast iron construction assures long life with minimum repairs. All gases burn automatically and safely. Engineering data available.
Page 42 Item 226

COMPLETE ATMOSPHERIC COMFORT
as well as proper food and drink conditioning were provided eight Savarin restaurants on the new Connecticut Thruway by this manufacturer's packaged water chillers, unit coolers, evaporative condensers, and air handling units. Information is available.
Page 43 Item 227

AIR MOVING EQUIPMENT.....
is designed for low initial cost and continuous, trouble-free performance. Each unit is completely built by the company. Catalogs are available.
Page 44 Item 228

DUCT LINER.....
made exclusively of strong textile-type glass fibers will not pull apart under high vibration and high wind velocity conditions. Information is available.
Page 45 Item 229

UNIT VENTILATOR CONTROL.....
provides greater accuracy and costs less to install. All electric control combines the function of thermostat and controller in a single package. Information is available.
Page 87 Item 230

JOB-SUITED FANS.....
are offered for central system applications. Engineers don't have to accept a compromise fan, loosely designed to cover any and all pressure requirements. Bulletins are offered.
Page 90 Item 231

COMPLETE-LINE CONDITIONING.....
enables custom quoting on every job. Company is signing on a select group of new air conditioning dealers. Complete air conditioning story offered.
Page 101 Item 232

Postage Will be paid by Addressee

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BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 36, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

AD-DIGEST SERVICE

HEATING EQUIPMENT.....
from this manufacturer is providing satisfying performance to customers throughout the country. A Vermont diner gets water heating and steam heat from the same unit and oil operating expense is very low. Information is available.
Page 105 Item 233

AIR CONDITIONING UNITS.....
are factory assembled for zone-by-zone air conditioning. Practical system met all economy and performance expectations of architects in new Salt Lake City building. Information is available.
Page 107 Item 234

EMPLOYEE WELL-BEING.....
and efficient manufacture are both aided by this manufacturer's air conditioning equipment at the new Avon cosmetics plant in Morton Grove, Ill. Information is available.
Page 109 Item 235

HIGH-PROFIT CONDITIONING LINE...
features maximum dependability, customer satisfaction, pre-sold prospects (national advertising beamed at virtually every prospect), and competitive pricing with generous profit margin. Information available.
Page 111 Item 236

SLOT-TYPE DIFFUSERS.....
combine the best features of both slots and efficient air diffusers to provide equalized air flow throughout entire length. Diffusers can be located anywhere to suit interior design. Catalog is available.
Page 113 Item 237

PACKAGED BOILERS.....
for either high or low pressure application are shipped with burner, control, gages, refractory—everything in place. Factory fire testing is available if desired. New literature is available.
Page 115 Item 238

SAFETY-GRILLE FILTERS.....
eliminated blow outs, reduced replacement time by 40% at Joseph Horne Co., Pittsburgh. Filters offer no danger of being cut by sharp metal edges. Information is available.
Page 117 Item 239

PANEL FANS.....
replaced monitor windows in a wise plant modernization program which produced more effective ventilation. Information is available.
Page 119 Item 240

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

FLANGES AND FITTINGS.....
from this manufacturer are accompanied by a guarantee which is the most complete in the flange and fitting industry. Catalog is available.
Page 121 Item 241

PRECISION AIR SCOOPS.....
for branch duct and grille collars are easily and economically fabricated by this manufacturer's Scoop-Rail. Information is available.
Page 122 Item 242

BIG GENERAL PURPOSE FANS.....
provide big performance for process and ventilating applications. Self-contained, in 12 sizes, in four types. Bulletin available.
Page 123 Item 243

EVAPORATIVE CONDENSERS.....
offer five-way savings in water, labor, time, power and money. A stock item, units are available for immediate shipment. Bulletin is offered.
Page 124 Item 244

INDUSTRIAL AIR FILTERS.....
from this company explode the fiction that removal of odors from the air requires bulky, expensive equipment, necessitating larger fans and motors to overcome resistance. Information is available.
Page 125 Item 245

EVAPORATIVE CONDENSER.....
bulletin describes units that are hot-dip galvanized after fabrication. Company pioneered blow-through principle. Primary coil surface copper tubing.
Page 126 Item 246

SEVERE THROTTLING CONDITION...
served by one of the manufacturer's valves for 23 years without repairs. After averaging 20 hours weekly on pump test line at pressures up to 1000 lb, only recently have some working parts been replaced. Booklet is available.
Page 127 Item 247

MODULAR BRICK SIZE VENTS.....
are the ideal air intake for all air conditioning units. Features of the cast aluminum products are neat appearance, weatherproofness, and economy. Technical data are available.
Page 128 Item 248

BOILER-BURNER UNITS.....
for gas, oil, or gas-oil combination firing are easy to size and specify. Forced draft eliminates costly and unsightly stacks. Information is available.
Page 129 Item 249

TWO HOLES IN THE SKY.....
mean cool water for air conditioning. Two 16-inch propellers, efficiency-engineered to this application, keep working temperatures uniform in a large mid-western office building. Bulletin is available.
Page 130 Item 250

EXTRUDED ALUMINUM SHUTTERS...
are of modern design, light weight, fully weather-stripped, easier to install, and are rust and corrosion proof. Complete specifications available.
Page 131 Item 251

BOILER LEVEL CONTROLS.....
are claimed to be the safest because they are simplest in construction. Controls have permanent magnet located outside float chamber eliminating mechanical parts normally subject to wear and fatigue. Catalog available.
Page 131 Item 252

INQUIRY CARD

Circle below Item numbers on which you wish catalogs or further information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
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244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265
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Ad-Digest

SUBMERSIBLE SUMP PUMP..... is built for automatic submerged operation. Designed to operate under water, this packaged unit is priced lower than many conventional sump pumps. Information is available.
Page 133 Item 253

BUILDING WATER COSTS..... are cut by $30,000 for air conditioning system in Syracuse, N. Y., through installation of this manufacturer's vertical 25-hp turbine pump. Information is available.
Page 134 Item 254

WATER-TUBE BOILERS..... are so compact, so efficient, they require only ¼ the floor space of conventional boilers of comparable ratings. They deliver instant hot water for full steam rating in five minutes from a cold start. Bulletin is available.
Page 135 Item 255

FLEXIBLE HOSE..... is adaptable for all kinds of fume and dust control and ventilation uses. It is durable, lightweight, and easy to install. Information is available.
Page 136 Item 256

INSTRUMENT REQUIREMENTS..... for measuring temperature, pressure, and humidity are met by this firm in wide, complete lines of indicating and recording instruments. Information is available.
Page 136 Item 257

GAS UNIT HEATING..... offers a flexibility which is just right for many commercial and industrial jobs. As a building grows the heating system grows with it. Booklet on modern heating is available.
Page 137 Item 258

INSULATION ADHESIVES..... provide excellent coverage, high heat resistance, and easier handling of insulation. A free sample and descriptive catalog are available.
Page 137 Item 259

NO FILTER..... does all jobs or meets every need. That's why the company's filters are engineered to the job to offer more effective dust collection. Bulletins are available.
Page 137 Item 260

HEAVY DUTY BOILERS..... There is a heavy duty, copper tube boiler in this manufacturer's line for every steam or water heating application up to 1.8 million Btu per hr output. Information is available.
Page 138 Item 261

SPACE-SAVING WASH FIXTURE..... for schools, institutions, and public and factory buildings handles two persons at a time. A bulletin describing the fixture is available.
Page 139 Item 262

LOW-COST HEAT ZONING..... is available with metering valve which provides the comfort of multiple zone heating at a fraction of the former cost. For steam or hot water, they are unconditionally guaranteed. Details available.
Page 139 Item 263

ACCURATE TEMPERATURE READINGS of hot water systems; floors, walls and ceilings; refrigerated coils; and insulation are easily taken with the manufacturer's portable surface pyrometer. Bulletin is available.
Page 139 Item 264

DUCT SILENCERS..... are produced to meet three specifications in acoustical efficiency: Moderate for low pressure drop, standard for medium pressure drop, and maximum for higher pressure drops. Literature is available.
Page 140 Item 265

IMPULSE STEAM TRAP..... and a fine screen strainer, both manufactured by the company, are a good team for steam. Steam trap book is available.
Page 141 Item 266

EXACT MOISTURE CONTROL..... for product improvement, protection of materials, or for process or tests, with absorbent, results in simpler, more trustworthy, less expensive system, as dehumidification and temperature control are separated functions. Descriptive bulletins explain.
Page 142 Item 267

SUBMERSIBLE PUMPS..... for home, industry, farm, and emergencies are described in a catalog which is available from this manufacturer. More pump profits promised.
Page 142 Item 268

FILTER-DRIER ..... incorporates an activated ceramic desiccant block for micronic filtration with granular desiccant for high efficiency drying at low pressure drop. Information is available.
Inside Back Cover Item 269

NEW ELECTRIC FLOW SWITCHES.... are applicable wherever it is important to know if a flow of liquid starts or stops. Dependable and moderately priced, they make or break electric circuits to control alarm, motor, burner, metering device, etc. Bulletin available details applications.
Back Cover Item 270

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BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 38, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

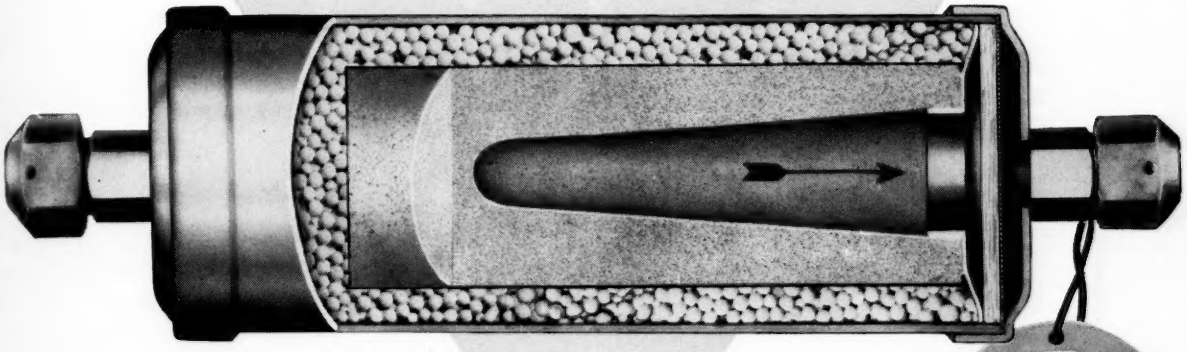
93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

"DRI-COR"

The Filter-Drier You'll Buy *Again, Again, and Again !*



LISTED BY UNDERWRITERS' LABORATORIES, INC. UNDER RE-EXAMINATION SERVICE FOR MAXIMUM WORKING PRESSURE OF 500 P.S.I. OR MINIMUM BURSTING PRESSURE OF 2500 P.S.I.

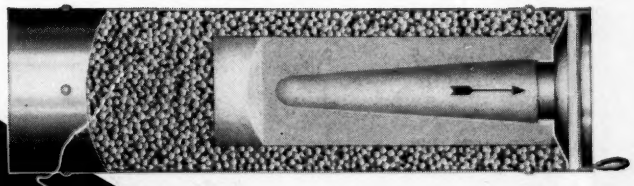
ABSO-DRY® PRESSURE SEALED DRIER

THEY are designed to give you greater satisfaction. That's why jobbers recommend them and servicemen everywhere have switched to "DRI-COR".

With a ceramic fired desiccant filter-core cushioned in a bed of blended MOLECULAR SIEVES AND ACTIVATED ALUMINA, they provide high capacity drying even at relatively high temperatures, micronic filtration, efficient acid removal and low pressure drop.

Because they are pressure sealed, "They Hiss and Tell" when you loosen an end connection seal cap at time of installation—proving they are factory fresh and factory dry.

STOCKED AND SOLD BY LEADING JOBBERS.



Also available . . . "Dri-Cor" Filter-Drier Cartridges for Henry Cartridge Type Angle Driers.

TYPES 77, 78 AND 79 ANGLE DRIERS

They have the same features as "DRI-COR" Filter-Driers, except that after being thoroughly reactivated each cartridge is packed in a metal moisture-proof container.

LISTED BY UNDERWRITERS' LABORATORIES, INC. UNDER RE-EXAMINATION SERVICE FOR MAXIMUM WORKING PRESSURE OF 350 P.S.I.

HENRY VALVE CO.

MELROSE PARK, ILLINOIS (Chicago Suburb)

Cable: Hevalco, Melrose Park, Illinois

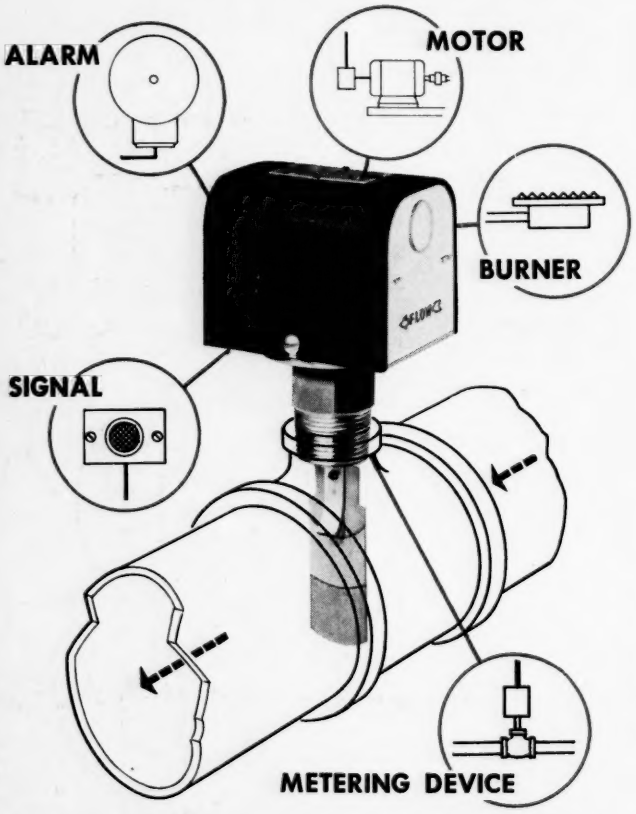
VALVES, DRIERS, STRAINERS AND ACCESSORIES FOR REFRIGERATION, AIR CONDITIONING AND INDUSTRIAL APPLICATIONS

HENRY VALVE CO. CONTROLLING FLOW SINCE 1914 ®

STOP or GO accord

McDONNELL FS4 SERIES FLOW SWITCHES

Versatile new way to start or stop a...



Wherever it is important to know if a flow of liquid starts or stops, right there you have a spot for the McDonnell FS4 Series Flow Switch. It is a dependable, moderately-priced device that makes or breaks an electrical circuit when flowing liquid moves the paddle. It's an effective way to provide safer or more automatic operation, available now in compact size and price to fit a broad range of applications.

Write for new bulletin Number FS-1 which shows the many possibilities this new Flow Switch offers as an automatic control or safety device.

McDONNELL & MILLER, *Inc.*
3500 N. Spaulding Ave., Chicago 18, Ill.

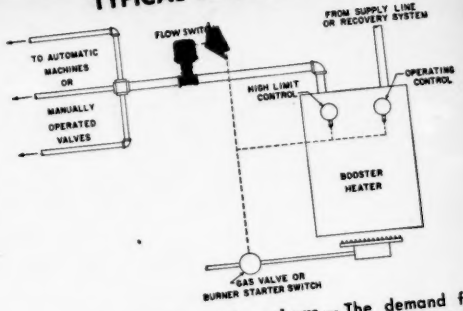
Doing One Thing Well

McDONNELL *Flow Switches*

Your Jobber Stocks Them

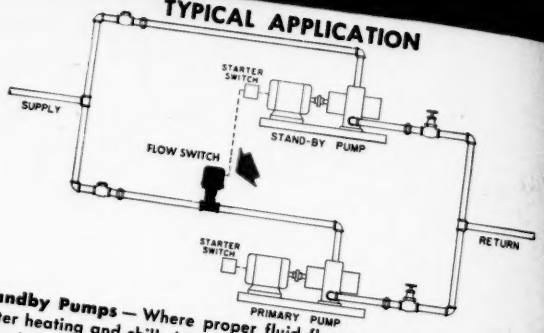
BOILER WATER FEEDERS • LOW WATER FUEL CUT-OFFS • PUMP CONTROLLERS • RELIEF VALVES • RELATED LIQUID LEVEL CONTROLS FOR TANKS, STILLS, AIR CONDITIONING SYSTEMS.

TYPICAL APPLICATION


TO AUTOMATIC MACHINES OR MANUALLY OPERATED VALVES
FLOW SWITCH
FROM SUPPLY LINE OR RECOVERY SYSTEM
HIGH LIMIT CONTROL
OPERATING CONTROL
BOOSTER HEATER
GAS VALVE OR BURNER STARTER SWITCH

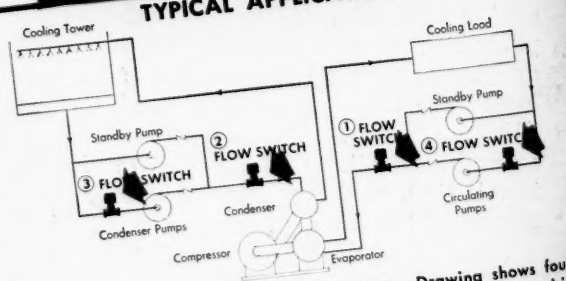
Hot Water Supply for Dishwashers — The demand for 180° water for rinsing tableware in public establishments (and for other commercial processes) frequently requires a booster heater. But the operating control on such a heater may not respond quickly enough, when a sizeable volume of water is drawn, to keep water from falling below 180°. With a flow switch in the line burner is started immediately when a draw of water occurs, to start recovery at once. When flow stops, flow switch returns control to the primary control.

TYPICAL APPLICATION



Standby Pumps — Where proper fluid flow is essential — as in hot water heating and chilled water cooling systems — a standby pump is often installed in parallel with the primary pump. In the system above, a reverse acting flow switch (breaks current with flow) is installed in discharge line from primary pump. If pump fails, and flow stops, flow switch cuts in standby pump.

TYPICAL APPLICATION



Chilled Water Air Conditioning System — Drawing shows four flow switches installed in the system. The circulating pump is started in normal manner. When there is sufficient flow, and only then, flow switch No. 1 allows the condenser pump to be started. Similarly, flow switch No. 2 allows compressor to be started when there is sufficient flow of condenser water. Flow switches No. 3 and 4 have reverse-acting switches, automatically cut in standby pump if primary pump fails. Use of the flow switches in this system assures continuous operation, starts system in sequence, stops compressor if there is not proper circulation in system, can be used to report operation on central control panel.